Cybernetic Circulation Complex

Big Tech and Planetary Crisis

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PREFACE

A Spectre Haunts the Planet

As we were completing this book, Marc Andreessen, billionaire co-founder of a leading Silicon Valley venture capital firm, Andreessen Horowitz, did us the inestimable favour of proclaiming in the clearest terms a viewpoint we oppose.

Technology, he argues in ‘The Techno-Optimist Manifesto’, is the foundation of civilization.[1] Growth is progress (‘societies, like sharks, grow or die’). All social problems are solvable through technology. Technology entrepreneurs are providers of the general good. Markets and technology combine in a ‘techno-capital machine, the engine of perpetual material creation, growth, and abundance’. Unlimited zero-emissions energy will come from nuclear power. The global human population can expand to 50 billion, then settle on other planets. Artificial intelligence is ‘our alchemy, our Philosopher’s Stone’. Humans are ‘technological supermen’ overcoming nature. Free markets are optimal. Socialism – aka central planning – is a ‘doom loop’. ‘Advancing technology’ is intrinsically virtuous, creating conditions necessary for finding the ‘meaning of life’. Techno-optimism is a duty.

Although the ‘Manifesto’ is framed as a celebration of ‘techno-capital’ in general, Andreessen is in fact a spokesperson for a very specific sector of its operations: Big Tech, the nexus made up of five gigantic digital corporations – Alphabet, Meta, Amazon, Apple and Microsoft, a list to which Tesla and Nvidia are sometimes added – alongside a layer of second-tier companies focused on networks and software, a mayfly swarm of

startups, and, of course, venture-capital enterprises such as Andreessen Horowitz, that, along with other financial institutions, keep the whole machine running. In an earlier essay, Andreessen wrote enthusiastically of how ‘software is eating the world’, with digital capital taking over and transforming activities ranging from phone calls to bookselling and healthcare; Andreessen is both a protagonist in and propagandist for this process.[2]

Optimistic as Andreessen’s ‘Manifesto’ may be, it is also defensive. The assertions of techno-capitalist triumph are bracketed by angry opening and closing denunciations of techno-critics as liars, deceived and deceiving, who may impede and delay the victory march. Andreessen is clearly concerned that the owners, directors and investors of Big Tech are not receiving the respect they deserve. There are good reasons for his anxiety.

In 2016, Turkish-American author Jarett Kobek published *I Hate the Internet*, a novel set in gentrifying San Francisco that revolves around the damage inflicted within its artistic communities by the screeds of online misogyny and racism unleashed by social media, particularly Twitter.[3] The book became an unexpected international bestseller, probably because its title bluntly challenged years of celebratory endorsements of Silicon Valley tycoons and their ‘disruptive’ innovations.

A decade later, Kobek’s sentiment is widespread. Whatever the flaws of Twitter once were, they are dwarfed by the chaos that followed its $44 billion purchase in 2022 by Elon Musk, and its transformation into ‘X’. Content moderators were fired, vicious charlatans such as Alex Jones reinstated, ‘blue badge’ authenticity verification went up for sale, and advertisers and users alike fled the free-fire zone of calumny and disinformation. More broadly, the digital sphere is seen as increasingly suspect for its rampant commercialization, omnipresent surveillance, gig-work exploitation, erratic censorship and toxic social media. In the United States, polls show that between 2018 and 2023 public confidence in tech

companies dropped ‘precipitously’, undergoing a fall ‘greater and more widespread than for any other type of institution’.[4] Elsewhere, a rush of belated attempts to regulate digital capitalism by neoliberal governments who had previously been happy to give Big Tech free rein reflect a growing, if politically confused and inchoate, ‘techlash’. Now, apparently *everyone* hates the internet.

In fact, we do not hate the internet per se, though we certainly do not love it as it is. We use it all the time: after decades in which every aspect of social life has been digitized, the dubious convenience of networks is now all but compulsory in affluent zones of capitalism. But beyond that necessity, and despite bouts of intense screen aversion and digital loathing, we continue to find sources of fascination, pleasure and solace in the virtual world’s vast streams, flows and fluxes of text, image and sound, even as they mix with abundant digital toxicities, outrages and hazards. Whatever its misuses, the network of networks continues to offer astounding affordances for cooperation and association, new methods of scientific research and artistic creation, fresh forms of collective subject-formation and vital means of sensing and comprehending the vast ecological changes now overtaking the planet.

Moreover, like every artificial wonder of the world, the network of networks is an incredible achievement not just of technology, but above all of the human labour that constructs that machinery. It is an apparatus built initially by the work of university scientists and independent hackers whose inventions were soon appropriated and privatized by the commercial sector, and then extended by the differentially rewarded and often outrageously exploited work of programmers, coders, software engineers and system architects, infrastructure constructors and maintainers, moderators, data cleaners, and miners of copper and coltan – and beyond that to the various gradations of users’ free labour that has been the basic propellant of the

whole system. Every login deserves a sharp in-breath saluting the digital workers of the world.

But if we do not hate the internet, what we detest is its capture, enclosure and transformation by Big Tech's nexus of billionaire oligarchs and finance capitalists. This has made the digital sphere an apparatus of accumulation, implanted with spyware, advertising and cyberweaponry, expanding regardless of human and planetary consequences. Big Tech's ascent has occurred amid climate chaos and capitalism's failing attempts to curb it, a global pandemic, proliferating war, imbalanced economic growth, aggravated inequalities and rolling social unrest. Digital technologies are involved in all these compounding crises, in ways that are always complex and contradictory, but often predatory and destructive. Techno-capital's social steering seems increasingly erratic; if software is indeed 'eating the world', then humans, and possibly humanity itself, are on the menu.

On this point, 'The Techno-Optimist Manifesto' makes a revealing error. One of the sources for his work on 'techno-capital', Andreessen claims, is the writing of Nick Land, the dark eminence of 'accelerationism'. But, in contrast with Andreessen's near-utopianism, Land, a reactionary and anti-human philosopher, sees and celebrates the outcome of capitalist acceleration as a species-liquidating 'meltdown' in which *Homo sapiens* will fall victim to an 'invasion from the future' by artificial intelligences.[5] What will triumph, in Land's view, is nothing but the impersonal process of techno-capital itself as a 'positive feedback circuit', in which

> commercialization and industrialization mutually excite each other in a runaway process … As the circuit is incrementally closed, or intensified, it exhibits ever greater autonomy, or automation. It becomes more tightly auto-productive … Because it appeals to nothing beyond itself, it is inherently nihilistic. It has no conceivable meaning beside self-amplification. It grows in order to grow. Mankind is its temporary host, not its master. Its only purpose is itself.[6]

Perhaps Andreessen did not understand the destination of Land's 'accelerationism', or perhaps he liked the word while ignoring the direction. Perhaps, as the shepherd of billions of dollars of venture capital, he fully understood and secretly approved of Land's vision of human annihilation by cybernetic accumulation. In either case, what this shows is the nightmare lurking within his 'techno-optimism': that of a digital capitalism making itself increasingly 'autonomous' from humans and ultimately threatening their existence.

Of course, Land's image of an AI-dominated Skynet remains fantastical, though the elements from which such a system might be assembled are already evident in Musk's SpaceX satellites and Neuralink brain implants, Israel's AI-selected weapons-targeting systems, and US and Russian drone-warfare systems. But there are other ways in which Big Tech is generating what Geert Lovink has called an 'extinction Internet', most notably by speeding and intensifying capital's biosphere-attacking spiral of production and consumption while weakening humans' capacity to think and act according to alternative logics.[7] Indeed, behind Land's image of capitalism as a cybernetic circuit lies a far older critical model of capital: Karl Marx's account of it as a circulatory process whose out-of-control logic leads to massive social and economic crisis. Today's 'poly-crisis' is significantly different from what Marx envisaged – ecological factors play a larger role than he could have conceived; but in many ways the basic dynamics of crisis are the same.[8]

Marx's circulatory model of capitalism guides our thinking in this book. Alongside the work of recent digital theorists, it has led us to coin a new name for Big Tech. In 2016, Nick Srnicek popularized the phrase 'platform capitalism' to describe the business model typified by companies such as Google, Facebook and Uber.[9] In 2022, Tiziana Terranova, riffing on this idea, wrote of a 'Corporate Platform Complex'.[10] We extend this further still to discuss a 'cybernetic circulation complex' (CCC): the cluster of

companies whose platforms, structured around cybernetic feedback loops between digital users and capital owners, function to accelerate the larger cybernetic loop of capitalist growth by automating the processes of sales, advertising, logistics and finance. We explain not only the inner workings of this cybernetic circulation of capital – a cybernetic loop of cybernetic loops – but the potentials it contains for the undoing of its current iteration of network practice, and the possibilities for radically different uses.

As critics of the CCC, we are enemies of Andreessen. ‘The Techno-Optimist Manifesto’ contains a long list of foes, including such lamentable creatures as ‘ivory tower’ academics and proponents of ideas as vile as ‘credentialed expertise’, ‘sustainability’, ‘social responsibility’, ‘existential risk’, ‘collectivism’ and ‘degrowth’. But across this motley crew of opponents, the author believes he detects a common denominator: many of these ‘zombie ideas’, he writes, derive from ‘communism’. In what might seem an amazingly retro-McCarthyite, Cold War, Red Scare tactic (situated alongside an ostentatious salute to US nationalism), Andreessen identifies the opponents of techno-capitalism as a bunch of commies.

To this we reply: ‘guilty as charged’. We are communists, albeit communists for whom, as Jonathan Beller puts it, recognition of ‘anti-racist, decolonial, feminist, queer and anarchic struggles’ is fundamental for that name ‘to have any relevance or meaningful future’.[11] Indeed, to make things worse for Andreessen, we are degrowth communists, or at least communists who do not believe in economic growth as an overriding social imperative. We have a different idea of what constitutes a good life.[12] Just as we do not share Andreessen’s optimism about techno-capitalism, we likewise repudiate Land’s reactionary nihilism. We do not bet on the inevitability of extinction, but rather on the possibility of averting that outcome. This depends on disconnecting the digital networks from endless growth, and their radical repurposing for a new mode of social reproduction

based on human equality and ecological sustainability – a revolutionary bet that we call biocommunism, making us, we suppose, ‘biocommies’.

The question of emancipation is one of both equality and ecology. The internet today is one of many sites of social contestation between not just ‘socialism or barbarism’ but, as McKenzie Wark puts it, ‘communism or extinction’; we would add that the remaking of networks will also entail a reinvention of the theory and practice of communism itself.[13] In that remaking we continue to draw upon, and radically reimagine, Marx’s concept of ‘circulation’. It is this idea that we adopt and adapt in our analysis of the contradictions and conflicts within the cybernetic circulation complex: Big Tech and planetary crisis.

1

Cybernetic Circulation Complex

ORBITAL REEFS

On 20 July 2021, Jeff Bezos blasted into the heavens aboard a rocket manufactured by Blue Origin, his privately owned spaceflight company. He and two companions momentarily circled Earth, turning zero-gravity somersaults while watching the planet below through extra-wide panoramic space windows. Two weeks before, Bezos had resigned from his position as CEO of Amazon, the company he founded and whose success put him in contention for the title of richest man on Earth, vying with rival astro-entrepreneur Elon Musk and Microsoft mogul Bill Gates. The Blue Origin rocket's brief off-Earth excursion was intended only as a prelude to his longer-term project: the creation of a for-profit space station, 'Orbital Reef', from whose perspective wealthy guests could gaze upon Earth with the same detachment as tourists viewing the solar-bleaching undersea corals of the overheating Pacific.

At a press conference after the flight, Bezos, with full-on billionaire-class nonchalance, declared: 'I want to thank every Amazon employee and every Amazon customer because you guys paid for all of this.' He may not have been sorry to depart the company he had so lucratively led. For reefs – threatening ones – were indeed apparent in the water. A year before, with Sundar Pichai of Google, Mark Zuckerberg of Facebook and Tim Cook of Apple, Bezos had been summoned on-screen for a virtual grilling by the US Congressional Subcommittee on Antitrust (that is, anti-monopoly). Only Microsoft (whose founder, Bill Gates, had undergone similar questioning

more than a decade before) was absent from a full conclave of ‘Big Tech’, a cluster of five giant digital corporations at the apex of US – and global – capitalism.

That these corporate leaders should be subject to hostile interrogation by US legislators perhaps seemed surprising. In 2017, Apple, Alphabet, Facebook, Amazon and Microsoft had together occupied the top five spots in rankings of US companies by market capitalization. These positions had previously been held by celebrated corporations such as General Motors and Exxon; but in 2020, just prior to the Washington meeting, the new tech giants claimed the five top positions globally, their nearest competitor being Saudi Arabian oil giant Aramco. From 2018 onwards, Apple, Microsoft and Google would each, at different times, attain a value of $1 trillion, some falling back below that line because of stock market fluctuations, but then crossing it once again. Apple went on to become the world’s first $3 trillion corporation.

Over the previous decade, these companies had transformed everyday life in the United States, and much of the world, with startling, often apparently generous, innovations: smartphones that placed previously unthinkable computational power in people’s pockets; unpaid access to social media that connected people across continents; free search, free maps, free email; a thousand and one handy ‘apps’ for everything from birdsong identification to instant hook ups; non-stop, ubiquitous streaming of music, film and games; online shopping, with next-day delivery to your door. The centrality of screens to social life and economic activity was demonstrated as never before during the pandemic lockdowns; Big Tech shares miraculously buoyed the US stock market amid the death and despair of global plague.

Nonetheless, the virtual hearing in Washington was fractious. Republican representatives took the occasion to accuse Facebook and Google of censoring conservative opinion – a charge that had been heard

with increasing frequency since the limited deplatforming of fascist influencers following the deadly Charlottesville riot of 2017. Democrats demanded answers about anti-competitive, market-distorting, innovation-stifling monopolistic practices. Each side criticized the other's political priorities and masking habits. The CEOs spoke blandly and expansively of consumers' love for their products and services. Thousands of pages of corporate documentation had been submitted. Eventually, in October, there would be a subcommittee report condemning Big Tech's monopolistic tendencies and recommending palliative, pro-market measures – but signed only by Democratic members.[1]

Meanwhile, in the hot nights of pandemic cities wracked with massive unemployment and violent civil unrest, concerns about Big Tech extended well beyond the points of competition law discussed in the comfortably air-conditioned hearings. Thousands of precarious gig workers – many employed by Facebook and Google, others by more minor digital companies such as Uber – were seeing their jobs evaporate amid economic crisis or otherwise continue under hazardous conditions. Friends and families split over what was the more outrageous issue – the 'Plandemic' video alleging Bill Gates's responsibility for the creation of Covid-19, or Facebook's forlorn attempt to suppress it as disinformation.

Others pondered downloading the Google and Apple contact-tracing apps to their smartphones, worried about the inscrutable daily surveillance such devices already subjected them to – or regretted their inability to afford a high-end phone at all. In the Black Lives Matter protests that had been ongoing since the killing of George Floyd, demonstrators mobilized via Twitter and WhatsApp confronted not only tear gas and rubber bullets, but also a digital panoply of drone-equipped, Big-Data-driven militarized policing, and demanded a halt to the racialized facial-recognition technologies under development by Amazon and Microsoft. Later that year, Amazon fended off a unionization drive by predominantly Black workers in

its fulfilment centres in Bessemer, Alabama. But by the time of Bezos's space trip, pandemic health and safety issues had stirred a new organizing movement in New York's Staten Island warehouse.

Elsewhere around the world, these circumstances were repeated, often in even more intense conditions. Low-wage, subcontracted employees of American Big Tech companies, including content moderators in Africa and electronics assembly workers in China, were brusquely shuttled in and out of work as requirements for workplace quarantine conflicted with the bonanza profits to be made from the online activity of locked-down populations. In Myanmar, South Africa and Colombia, users were exposed to the combined ravages of advertising and toxic mis- and disinformation, sometimes with fatal results. From Ecuador to Iran, state security forces deployed the arsenal that Big Tech's paramilitary offshoots provided, even as protestors used its platforms to mobilize against police. Increasingly, governments that had once quietly acquiesced to Big Tech's incursions now struggled to regulate the US oligopolists – or, alternatively, to construct their own counterparts or counterforces.

These dynamics would continue beyond 2020, alongside demands for technological solutions to a mounting climate emergency and for new weapons to deploy in suddenly exploding wars. In a planetary crisis in which accelerating commodification, multiplying social conflicts and intensifying biospheric catastrophes intertwined, there would clearly be a large place reserved for Big Tech – or, as we will term it here, capitalism's *cybernetic circulation complex*.

HUBS, STACKS, PLATFORMS

The internet originated in US military thinking about nuclear war – in particular, how to protect its communication system of command and control. When Paul Baran, a researcher with a US Air Force think-tank,

turned his attention to this problem in the early 1960s, he approached it from the point of view of network design. Baran compared three different forms of a network.[2] The first was centralized: all connections converged on a central node, like the spokes on the hub of a wheel. In the second – which Baran termed decentralized but might better have been termed multi-centred – a handful of key nodes that were linked to one another each radiated connections to a cluster of less important sites, like stars surrounded by planets. The third form was one in which all nodes were of equal weight and were able to connect with one another. It was this last form – the distributed network – that Baran recommended for a communication system that could survive being blown to tatters in a nuclear attack.

When, in 1969, the Pentagon initiated the progenitor of the internet, the Advanced Research Projects Agency Network (ARPANET), it was not as a nuclear war fighting system, but rather as a means of connecting military researchers at US universities. Over the next decade, academics, students and hackers took over ARPANET, extending its use to non-military academic projects, and also to discussions of science fiction and playing of computer games. They imagined they were building a distributed network.

The idea of a distributed network – with all it suggests about democratic, participatory, egalitarian communication – was particularly attractive to the early adopters of computer communication from the countercultures of California and elsewhere (including opponents of the Vietnam War and experimenters in communal living). ARPANET's pioneering experiment passed to the control of US government agencies, becoming the internet, and was then gradually privatized and handed over to corporate operators. This model of a non-hierarchical, flat communication system deeply informed the 'digital utopianism' of early self-styled 'netizens' who saw the internet as an intrinsically liberating and emancipatory technology.[3] It was also an ideal eagerly seized upon by commercial entrepreneurs of Silicon

Valley who represented themselves as rebel disruptors of archaic power systems.

As popular use of the internet became widespread in North America and Europe in the 1990s, information scientists began to map the emerging patterns of digital traffic. What they found was very different from the horizontal, egalitarian many-to-many exchange that cyberutopians had anticipated. Instead, more and more connections were flowing in and out of a diminishing set of dominant nodes. The pattern was not that of an evenly expanding, centreless meshwork, but rather of an increasingly hierarchical multi-centred system in which a handful of ‘star’ sites channelled network flows.

Network scientists Albert-Lázló Barabási and Réka Albert christened these nodes ‘hubs’ and proposed that their rise was an intrinsic aspect of network growth. Users seeking out social contacts, shopping bargains or search results would be ‘preferentially attracted’ to nodes that already offered the most connections or links for these purposes. Thus there would be an intrinsic dynamic in favour of nodes that were big, in terms of traffic, becoming even bigger, for the successful to become more successful; indeed, as Barabási frankly remarked, this was a network dynamic that made the ‘rich get richer’.[4]

Some nodes would become very large indeed, continuing to expand their share of network traffic. The combination of network growth and ‘preferential attachment’ would spontaneously – and inevitably – lead to the rise of giant hubs.

It is easy to see the correspondence between giant hubs and Big Tech. Everyone flocks to Facebook (or, at least, they used to) because everyone else is there. They hail an Uber because it has the most drivers; they use Google because it is the search engine with the most users, users whose activities help Google train its search engine and thus outdo its rivals. Network scientists often describe the tendency of ‘scale-free’ or ‘rich-get-

richer' networks in terms of 'power laws' – mathematical tendencies supposedly inherent in nature. Barabási's and Albert's account of networks broadly echoes the most famous of all power laws – the 80/20 'law of the vital few', also sometimes termed the 'Pareto principle' after Vilfredo Pareto, the Italian economist who formulated the principle that, in any social system, 20 per cent or fewer of the actors gain 80 per cent of the wealth.

But other economic theorists see hubs very differently, as concentrations of ownership generated not from mathematical laws but from social forces. For example, John Bellamy Foster and Robert W. McChesney, two political economists of media, argue that concentrations of ownership manifest the dynamics of capitalism: a small social minority of capitalists own the means of production; the majority of people must sell their working time for a wage; and the capitalists compete against each other for profit.[5]

In such a society, concentrations of ownership like those enjoyed by Big Tech in the digital sphere do not arise spontaneously, but rather from pre-existing advantages and a ruthless competitive strategy. Only those backed by deep-pocketed venture capitalism get to start a Facebook, Google or Uber: success depends on undercutting competitors, often by keeping down labour costs (as in Uber's gig-work model), buying competitors (as Facebook did with Instagram and WhatsApp), controlling vital 'chokepoints' (as Google does when phone companies using its Android operating system pre-install Google search and maps), or giving their own products preference in markets they control (as Amazon does for its own brands).[6] The control of markets – if not by a single monopolist, then by a small group of oligopolists – is not peculiar to the tech sector. In the United States it is a feature of the pharmaceutical, airline and agribusiness industries, as well as many others. Network effects may help sustain monopolistic digital ownership – yet hubs are not simply a spontaneous product of networks, but specifically of capitalist networks.

Criticism of such concentration of ownership comes not only from socialist or left-liberal critics of capitalism, but also from champions of the free market.[7] Ultimately, the two critiques are divergent: one seeks to dissolve monopoly to save and reinvigorate capitalism; the other sees monopoly as a tendency pushing capital to its inevitable and desirable demise. This can bring together strange bedfellows in the attempt to 'break up' Big Tech.

While theories of concentration of ownership account for the 'Big' in Big Tech, they do not necessarily have anything enlightening to say about the 'Tech'. In response, other critics of Big Tech have offered the broader, more speculative metaphor of the 'stack', invoking the towering office complexes that incarnate corporate power. But this term also has a meaning specific to computer science, where it refers to an abstract modelling of the logical sequence of operations that a computer program executes to complete its task, visually represented as successive layers of processing activity. In 2012, the science-fiction writer and futurist Bruce Sterling declared discussion of 'the Internet' obsolete.[8] It made much more sense, he argued, simply to study Google, Apple, Facebook, Amazon and Microsoft as 'vertically organized silos' shaping the digital domain from back-end cloud storage, through devices and interfaces, to apps and content. He named these giants 'the Stacks'.

Four years after Sterling's speech, 'Stack' supplied the title and master metaphor for Benjamin Bratton's magisterial study of software and sovereignty.[9] Bratton's version of the Stack is more expansive than Sterling's, and differently inflected. Its six levels ran from 'Earth' (the energy systems required to power networks), through the remote computing infrastructures of the 'Cloud', the organizational systems of 'City', the communicational protocols of 'Address' and the display screens of 'Interface', to the 'User' (human or automated).[10] The interaction between these levels is framed by Bratton as gradually turning the internet into an

‘accidental megastructure’ of global governance, subverting and superseding the powers of nation-states and other political institutions. This account certainly includes discussion of the role played by digital corporations. However, Bratton writes from a self-declared ‘technocratic’ perspective. His understanding of the Stack reveals a vision of the emergence of AI and machinic intelligences. This is an analysis that offers us a futurist shiver of alarm and awe, a chilly celebration that suspends the question of whether such an inhuman future would amount to anything other than the total triumph of capital over its biological subjects.

Perhaps more influential than the theory of the Stack has been Nick Srnicek’s analysis of ‘platform capitalism’. At their simplest, Srnicek says, platforms are ‘digital infrastructures that enable two or more groups to interact … bring[ing] together different users: customers, advertisers, service providers, producers, suppliers’.[11] A platform’s success is ‘reliant on “network effects”: the more numerous the users who use a platform, the more valuable that platform becomes for everyone else’.[12]

But platforms have a very specific set of power relations – a politics – embedded in their architecture: ‘The rules of product and service development, as well as marketplace interactions, are set by the platform owner’, and this enables them to operate platforms as ‘an apparatus’ for ‘extracting and using a particular kind of raw material: data’.[13] This, the ‘new oil’ of capitalism, becomes a major source of revenue for platform capitalists, either used for micro-targeted advertising, gig-worker surveillance, product redesign, or sold to third-party brokers. Srnicek describes various types of platforms and outlines the business models that drive each of them. He posits the major company of Big Tech as only the highest level of a wider form of capitalist enterprise, one in which major firms expand out from initial beachheads in the digital domain to invade ever larger networked territories, in a process of silo-ization, in which the largest firms aim to enclose users in an exclusive world of apps and devices.

Srnicek's platform analysis has identified a key form of digital capitalism, synthesizing both organizational and technological factors. The idea of platform capitalism has, with good reason, been widely adopted and elaborated.[14] Indeed, the horizontal metaphor of the platform has proved perfectly acceptable to digital capitalists themselves. Today one can find books advising businesses how to build their platforms.[15] Uber's owners have claimed that, because their enterprises are 'platforms', not just plain 'capitalism', they should be exempted from established norms of regulation.[16] This is clearly contrary to the intentions of Srnicek and other critical platform theorists, but it does suggest that platform theory should not be accepted as the last word in analysis of Big Tech.

This account of theories about Big Tech is of course far from exhaustive; we will encounter others throughout the book. Although we have briefly indicated some of the problems we see with each perspective outlined here, our overall approach is synthetic and additive. Big Tech companies *are* network hubs, and at the same time monopolistic concentrations of ownership; these concentrations *are* key points in a stack of planetary computation generating advanced AIs and other enigmatic technologies radically changing human beings' relations to machines and to one another; and they *are* platforms – sites of huge social congregations marshalled by capitalists for the purposes of value extraction. To all this we now add another element: circulation.

CIRCULATION

We must now for a moment leave high-level Washington meetings, turning away from futuristic AI dreams, and touch down in the smoggy London of the 1870s, at the squalid rental apartment where Karl Marx, supported by his impoverished wife and family, strives unsuccessfully to complete his magnum opus, *Capital*.

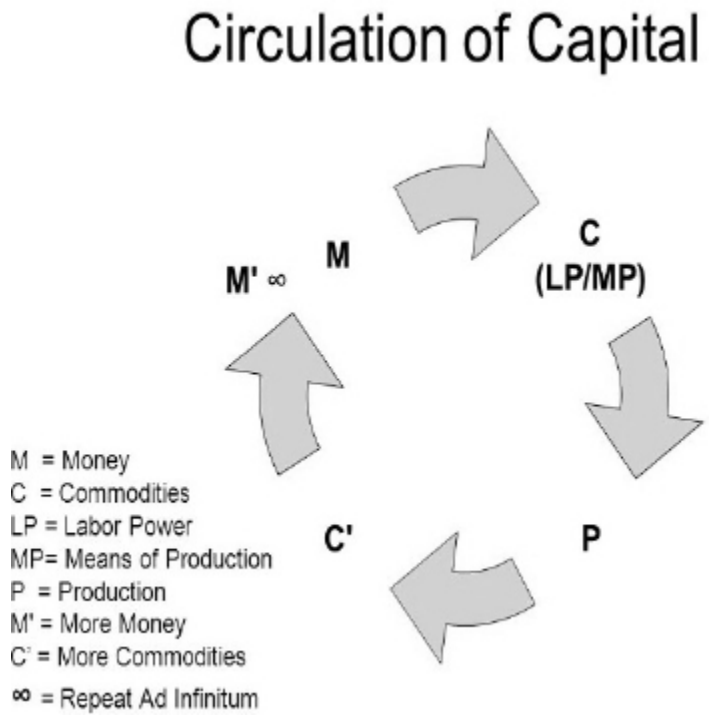
Circulation is not one of Marx's most well-known concepts.[17] It is overshadowed by his theories of production, labour and surplus value, the focus of Volume 1 of *Capital* – the only volume Marx completed, and the only one most people read. Circulation is dealt with in Volumes 2 and 3, which were assembled by his friend Friedrich Engels after his death. These texts are often dry, lacking the vivid imagery and turn of phrase that make many of Marx's other works so compelling. This is partly compensated for in Marx's treatment of circulation in the *Grundrisse* – composed of notebooks unpublished during his lifetime – where it is the topic of some of the most brilliant passages he ever wrote; these, however, have to be hunted down amid what is a sprawling, daunting text. But, despite these difficulties, Marx's concept of circulation offers a key to understanding today's giant digital corporations. Here we will lay out Marx's thinking about circulation, presenting it first in the same abstract terms he uses and providing concrete illustrations later.

Marx described the workings of capitalism as a 'circuit'. This process is expressed in a formula: M–C(LP/MP) … P … C–M′. Although this algebraic expression – which might be called capital's master algorithm – seems formidable, it is in fact easy to understand. Money (M) is used by the capitalist to purchase commodities (C), including labour power (LP), and the machinery and raw materials that are the means of production (MP). These are thrown into production (P) to create new commodities (C) that are sold for more money (M′), part of which is retained as profit, and part of which is used to purchase more means of production to make more commodities. The money at the end of the process is greater than that at the beginning, and the value of the commodity produced is greater than the value of the commodities used as inputs. This sequence is repeated ad infinitum, on an ever-expanding scale. Because the circuit expands with each repetition, it cannot properly be represented as a circular diagram: it

demands a three-dimensional visualization as a constantly enlarging spiral, depicting a ‘vortex’ or whirlwind process.[18]

This cycle can be divided into three phases: that of production-capital, in which labour power, machinery and material goods and services are created (P); that of commodity-capital, in which those goods and services are exchanged for money (C–M); and that of money-capital, in which this enlarged amount of money is used to buy new means of production (M–C). Unsurprisingly, Marx refers to the first phase (P) as the ‘sphere of production’; he calls the other two phases, C–M and M–C, the ‘sphere of circulation’.

Circulation thus contrasts with production. Production is the workplace; circulation is the market. Production is industry; circulation is sales, advertising and finance. Production is making; circulation is buying and selling. Production is labour; circulation is exchange. Production is the transformation of materials; circulation is goods moving from seller to buyer. Production is factories, mines and plantations; circulation is shops, credit cards and banks. And so on.



According to Marx, it is only in production (P), where human labour transforms raw materials into commodities, that ‘surplus value’ is created. The capitalist exploits workers by paying them the costs of reproducing their labour – in other words, wages sufficient to ensure they keep on showing up to work. All the extra potential money, or value, generated by the making of new goods and services can be appropriated by the capitalist. Production is therefore the primary moment in capital’s circuit, and circulation is a secondary, subordinate process. For this reason, Marxists have tended to keep their eyes glued to the workplace, giving less attention to what happens in markets.

But Marx makes clear that circulation, the apparent supplement to production, is also its indispensable condition. Circulation is necessary to production. For surplus value to be realized as profit, commodities must exit production and go to market, where they can be exchanged for money. If the commodity is not exchanged, its metamorphosis (M–C–M′) is not consummated. Only if circulation succeeds does capital become an autocatalytic, self-generating, boot-strapping growth process, a ‘constantly revolving circle’ in which ‘every point is simultaneously a point of departure and a point of return’.[19]

Since surplus value, Marx says, is only generated in production, circulation cannot add to the value of a commodity. But it can increase the speed with which commodities are exchanged for money, realizing their value. Increasing the velocity of circulation decreases the time in which a given quantity of capital ‘turns over’ from commodities to money and back again, thereby increasing its profitability. Because circulation is dead-time for capital, reducing its period can have much the same effect as expanding the vital growth-giving, value-creating process of production: the shortening of circulation time is a value multiplier.

This aspect of circulation explains capitalism’s addiction to speed, its compulsion towards the ‘annihilation of space by time’ through the

development of new means of transportation and communication.[20] In one memorable passage, Marx writes of how it is capital's ambition for circulation to proceed 'as it does in the mind, where one concept turns into the next at the speed of thought, in no time' – a dream that is, however, frustrated by its simultaneous need to preserve the distinct forms of 'commodity' and 'money', so that a profitable transaction can take place; the commodity 'must spend some time as a cocoon before it can take off as a butterfly'.[21] Reading this passage, it is impossible not to think of the promise made some thirty years ago by Big Tech mogul Bill Gates to implement a 'frictionless' capitalism operating 'at the speed of thought' – and the practical problems of digital piracy and copyright enforcement that attend this fluidity.[22]

Though Marx distinguishes production from circulation, he insists on their relation. There are liminal, border-zone activities, such as transportation, that he assigns to different categories in different passages. He notes how means of circulation (transportation, communication) themselves must be produced, pointing to how making railways and steamships boosted capitalist industry. He writes of how increases in production require expansions in circulation – in other words, larger markets – in turn transforming production, and inventing new needs for it to fulfil. He observes both how circulation, as the buying or selling of labour power, creates the workforces for production, and how circulation itself is a site of labour. Thus, the relation between production and circulation is, in Marx's terms, 'dialectical' – interactive, shifting, many-sided.

In some of his formulations, the contrast between production and circulation dissolves:

> In its circulation, capital expands itself and its path, and the speed or slowness of its circulation itself forms one of its intrinsic moments. It becomes qualitatively altered in circulation and the totality of the moments of its circulation are themselves the moments of its production – its reproduction as well as its new production.[23]

The situation is all the more complex because of an ambiguity in Marx's terminology. While he generally uses 'circulation' to refer to specific phases in the circuit of capital, he sometimes uses it to signify the *entire* circuit of capital. Thus, while 'circulation 1' refers only to activities outside the production of commodities, 'circulation 2' encompasses all of the transformations of value through money: the purchase of labour and machinery for production; the making and marketing of commodities; all the financial activities of banking, debt and credit by which commodities and money are switched back and forth. In Marx's work, the concept of 'circulation' thus performs a theoretical *tromp l'oeil*, or conceptual synecdoche, making a part of capital's circuit signify the whole, or, conversely, the whole designate one of its parts.[24]

This is certainly confusing, but perhaps also illuminating. It points, we suggest, to a historical process by which capital as a whole becomes increasingly *circulatory*: production, marketing and financialization become more tightly integrated; ever larger ratios of waged labour are devoted to logistical, marketing and financial activities ('circulation 1'), rather than to production; the 'annihilation of space by time', the mission of 'circulation 1', is intensified by production operations at the scale of the world market – and the whole ensemble is increasingly governed by the logics of velocity.[25] Circulation, understood as a crucial but delimited part of the circuit of capital, develops its own historically evolving apparatus of warehousing, logistics, shops, marketing, advertising, financing and all the communicative flows these entail, and in turn connects these sites to production in factories, studios and homes-turned-workplaces. Our contention is that Big Tech is the contemporary version of this process: a constellation of corporate forces introducing a new phase in the networked digitalization of capital's circuit.

We are far from the first to explore the idea of circulation in relation to media, and to digital networks in particular.[26] Jonathan Beller has produced a brilliant analysis of global capitalism as the 'world computer'.[27] He proposes that, under conditions of networked computerization, digital data is the constant accomplice to all the calculations of market value that capitalism conducts at various points in its circuit. Computation, he says, is the medium through which capital's process of abstraction is now accomplished, rendering down the specificity and sensuous dimension of every particular entity or event – a bowl of rice, a Lexus, a coat, an automatic rifle, an evening sunset view, an hour of labour – into price, making it an exchangeable, quantifiable commodity whose measure is money.

Beller, a cinema scholar, suggests that this logic obtains not just for obviously commercial messages and transactions – such as digital advertisements and online shopping – but more broadly throughout contemporary culture. For example, the streaming images of film and entertainment media function as elaborate encoded statements about the 'value' of people, places and actions. In the world computer, 'information is the processing power of money itself' and 'computation is the thought of capital'.[28] On this basis, Beller expands Marx's formula for a circuit of capital by inserting the processing of digital information, 'I', as a vital stage in every operation, from the payment of wages to the pricing of goods, and from credit ratings to the compounding debt on your credit card. M–C–M′ becomes M–I–C–I′–M′.

Our examination of the cybernetic circulation complex shares in but concretizes Beller's general proposition, identifying the central agencies in the process he describes and – just as important – the movements challenging them. Marx's concept of circulation provides the theoretical core of our analysis of Big Tech. However, applying Marx's ideas to a

world of cloud computing, social media and cryptocurrencies clearly requires us to recognize that capitalism, and movements opposing it, have changed dramatically since Marx was writing. These changes demand revisions to his concept of circulation in three main areas.

First, feminist Marxists have pointed out an omission in Marx's model. After the moment when a customer buys a commodity (C–M), Marx is uninterested in what happens to it. However, using commodities requires work – shopping, cooking, cleaning, childcare, eldercare, relationship maintenance and management of a social existence. This endless sustenance of everyday life, predominantly done by the unpaid labour of women, stands at the centre of generations of feminist analysis of social reproduction and care work.[29] Drawing on this line of feminist thought, some Marxist economists conclude that it reveals a missing moment in Marx's circulation model, the *circuit of the reproduction of labour power.* This is the phase in which labour power (LP) is again combined with other commodities (C) as a means of production. Such labour is often free, and frequently female; its site is the home, or whatever other living space the user can find; and the product is the commodity labour power (LP). That is to say, the worker herself, once again prepared to sell her working time, in the M–C(LP) transaction – or repeat the cycle of unpaid domestic labour.[30]

Issues of social reproduction stand at the centre of many contemporary alarms about the power of digital capital. These include concerns about Big Tech's expanding capacities to shape and automate what have previously been considered household relations. Sexist stereotypes of unpaid care work continue to influence many digital workplaces in ways ranging from the pay inequalities and harassment notorious in the tech industry, to the issue of who is able to maintain digital work-from-home households.

Our analysis therefore engages with the work of feminist theorists, such as Elise Thorburn on the crisis of networked care, and of Kylie Jarrett on 'digital housewifery'. Both illuminate the way in which social reproduction

is reshaped by digital commodity circulation, declining social services and the old and new gender codings of networked culture.[31]

Second, the work of Black and Indigenous Marxists, and of other Marxist theorists from the Global South, shows how Marx's model of capital's circulation underestimated the roles of slavery and colonialism. Despite his various acknowledgements of the role of these factors in capitalism's ascent, most of his analysis was centred on how this process unfolded in Europe, and particularly in England. This focus downplayed the ways in which the world market Marx saw as the outcome of expanding circulation was (as it remains) divided, stratified and segregated into zones of differentially valued human life. When money (M) buys the commodity (C) labour power (LP), that of black, brown, yellow and red bodies is repeatedly sold as cheap, indentured or enslaved labour. Capital has variously intensified or relaxed this racialized stratification of the price of life according to its labour needs.

Like Beller, we therefore see digital capital as (still) 'racial capital'. This is evident in a history that includes the use of early computers and networked centres to orchestrate the bombing campaigns of US colonial wars in Southeast Asia; Silicon Valley's early de facto segregation into clean and polluted areas, the latter housing Asian and Latin American workers employed in toxic chip manufacture and electronic assembly until these jobs were offshored to China; and the smartphone manufacturing industry's notorious reliance on mineral extraction in the ultra-exploitative context of war-torn Congo. In this book, we meet these dynamics again in the context of globalized low-wage work in logistics, content moderation, and AI data cleaning, and in the role of racially discriminatory algorithms in organizing social media. But we also show how some of the most significant resistance comes from the Global South, and from racialized workers and communities in the North.

Third, an era of climate crisis and mass extinction demands an ecological understanding of capital's circulatory processes. Some thirty years ago, James O'Connor called attention to how, in the circuit of capital, nature functions as 'tap and sink' – that is to say, as both a source of raw materials and a destination for waste.[32] Eco-Marxism has emerged and flourished in the intervening years, complete with its own sects and controversies, but consistently repudiating the assumption that the circulation of capital can be separated from the so-called 'externalities' of a natural world in which it is inextricably embedded. One recent fruit of this current has been Kohei Saito's radical reassessment of Marx's work, which argues that his later notebooks show the emergence of a 'degrowth' element that contests, rather than celebrates, the expansionary drive of capitalist circulation.[33]

Whatever the validity of this assessment, today any viable Marxism must be an eco-Marxism, insofar as it understands the circulation of capital as intertwined with the circulations of the carbon emissions, heatwaves, rain, ocean currents, rivers and non-human species. We are therefore broadly sympathetic to Michael Hardt and Antonio Negri's proposal of a Marxist biopolitics, but take the idea in a different direction from those thinkers, towards biospheric issues of global boiling, zoonotic pandemics and war, in which Big Tech is deeply entangled.[34] At the same time, we advance our own ideas of 'biocommunist' counter-power. On these three counts, we propose a revision of Marx's circulatory diagram, updating it not to 'remain the same', but to keep fighting while reaching for new weapons.[35]

CCC

How should we understand Amazon's rapid 'arriving today' deliveries, and the vast infrastructures that enable them? What function does Alphabet's

and Meta's surveillance-based algorithmic advertising play? What is the role of Apple's iPhone and its Google-developed Android competitors in creating a global app culture? What are the purposes of the huge cloud-computing centres established by Amazon, Microsoft and Google?

We see this cluster of massive corporations as a set of interrelated, often collusive, yet also rival capitalist enterprises whose profits are primarily driven by the computational advertising, retailing, transportation and delivery of, as well as payment for, commodities. These include, by way of the gig economy, the all-important commodity of labour time, enabling the production of the digital devices and services that facilitate these cybernetic circulatory processes.[36] That is why we refer to this system as the Cybernetic Circulation Complex (CCC).

'Complex' in this context refers to a collection of institutional relationships and interactions, as in the well-known term 'military-industrial complex' (with which, as we will see, the CCC has increasingly close relations). The CCC is a tiered complex. The highest layer is constituted by the five great digital corporations – Alphabet (formerly Google), Amazon, Apple, Meta (formerly Facebook) and Microsoft.[37] These companies have regularly been listed among the five most valuable on the planet. This layer is the major focus of our discussion, because of the power of the Big Five corporations and because they will be household names to most of our readers. In the course of our analysis, we also discuss why some commentators have recently proposed adding Tesla and Nvidia to the roster, so that (in the language of stock-market promotion) the Big Five become a 'Magnificent Seven'.

Below these premier corporations, however, there is a second layer – which can itself be further subdivided – of smaller but substantial cybernetic circulation capitalists, some whose names are included in the rosters of Big Tech because their business practices seem to exemplify the way the tech sector makes money.[38] This stratum includes familiar names,

such as Uber, Twitter (now X) and Netflix, but there are others, such as PayPal, Salesforce and Palantir, that are as or more important to an analysis of digital circulation. Occupying a third level is the swarm of startups, aspiring to become – or more likely be bought by – companies at the higher levels. And in a fourth category are the specialized forms of finance capital – specifically venture capital, which has been integral to the CCC since the early days of Silicon Valley.

In these processes the CCC interacts with other sectors: Big Tech is interdependent with Big Telecoms, which have provided the wired and wireless infrastructure; with the logistics sector, whose physical transportation of goods is itself becoming automated and digitalized; with entertainment corporations, which provide content for the CCC; and above all with finance capital, in which venture capital operates as a gateway to a larger symbiotic embrace of Big Tech and Wall Street. But while these interfaces make the boundaries of the CCC fluid and porous, those boundaries define a sector distinct enough to justify the colloquial name 'Big Tech'. This is a distinctiveness that we frame in terms of these companies' control and transformation of processes of cybernetic circulation.

As a RAND Corporation report states, 'firms in the technology and telecommunications sector represent some of the most connected in the observed production networks'.[39] A 'shock' to Amazon, the report concluded – particularly to the corporation's AWS cloud-computing services – from either a cyberattack or severe weather, could propagate and ripple across the entire sector. The report concludes with anxious thoughts about whether these tech firms might have become 'too big and too interconnected' in a way that requires 'mitigation'. The rise of such a complex has had global implications, but it emerged initially from US capitalism. We will use 'CCC' as a standalone abbreviation to refer exclusively to the US version; when we come to the crucial story of China's

rival formation of a comparable sector, in the form of companies such as Alibaba, Tencent, Baidu and Huawei competing with US rivals in the world market, we will refer to ‘China’s CCC’.

In proposing that we think of Big Tech as the CCC, we are following the lead of political economists who point to what they see as the growing role of circulation within global capitalism. The rise of the CCC does not mark the supersession of production by circulation, but it does signal both the increasing subordination of the former to the latter and an intensifying fusion of the two functions. The CCC companies do produce – but when they do their products are mainly the digital devices and data centres that serve to speed circulation. The Big Five’s vast wealth allows them to make investments in fields ranging from healthcare to clothing brands and space travel; but circulatory processes and devices remain at the core of their ongoing accumulation.

In specifying that this complex is ‘cybernetic’, we are of course pointing chiefly to the central role of computers and digital networks in this complex, as in popular usages such as ‘cyberspace’, ‘cyberpunk’, ‘cyberwar’, ‘cybercities’ and indeed ‘cybercapitalism’.[40] It is the accelerating power and versatility of digital systems – encapsulated in Moore’s Law of the exponential increase in the processing power of microchips – that enables the complex’s new synthesis of formerly separate circulatory domains and, in particular, their intensified automation.

But we also invoke the more specific connotation of the historical school of cybernetics and its study of communication through feedback loops. Through the work of Norbert Wiener, John von Neumann, Ross Ashby and others, this work stands at the root of computer science. We argue that feedback loops are central to the CCC insofar as it relies on controlling the speed and direction of communication and information.

Marx’s model of capital’s circuit was itself ahead of its time. Today’s cybernetic loops – in which the whole profit-making movement of M–M′

exemplifies a positive, growth-oriented feedback loop – move at hyper-speed. The Cybernetic Circulation Complex's major task is the acceleration and amplification of this overarching loop of expanding monetary value. But the complex also relies heavily on other subordinate and internal feedback loops, most notably those characteristic of social media platforms, in which users' inputs – postings to Facebook, videos to TikTok, queries to Google – receive immediate responses that encourage further user inputs. The data gathered at every moment of this process enables the refinement of targeted advertising. In this and other internal feedback processes – such as the 'recommendations' deployed by Amazon and other digital merchants – the CCC fulfils its role within the larger macro-loop of capitalist circulation.

The term Cybernetic Circulation Complex thus designates a system of interrelated corporate actors which, in deploying and developing advanced digital technologies and information flows, ensure their own individual profit circuit by smoothing and speeding the overall motion of capitalism's larger M–M′ cycle. The corporate actors in this segment are at once competitive and collaborative: tech companies are rival oligopolists which occasionally take up common cause against government regulation. The system as a whole is characterized by feedback loops: adaptive mechanisms through which it adjusts and optimizes its functions based on the information or feedback it receives, ensuring efficient operation within the network. Such processes are achieved through AI-based automation and other cybernetic technologies.

IN THE MEGANETS

David Auerbach, a software engineer who worked on the development of Microsoft's Windows Messenger service and later at Google, argues that the great digital corporations now take the form of 'meganets' – persistent,

evolving, opaque, always-on data networks. For Auerbach, these meganets consist of massive arrays of servers, a programming staff, and millions upon millions of users. These users are constantly active: they '*operate on* that network, making ongoing changes to it and … are in turn *operated on* by that network in a feedback loop'.[41] A meganet 'computationalizes its users' – that is, it assesses them by their actions – according to what they buy or express interest in buying.[42] However, the loop of meganets has an inbuilt tendency to '[outpace] humans' ability to control it' as it accumulates 'users, data and connections'.[43] According to Auerbach, a successful meganet, such as Google, 'becomes increasingly out of control – not because it has a central will of its own', but because it becomes increasingly independent of its owners and operators': 'As it grows, its internal feedback structure must also grow, its components acting upon one another with increasing speed and complexity, until more and more of its evolution is determined from within rather than from without. A meganet that fails to grow is a failed meganet. Increasing feedback and increasing complexity are inevitable.'[44]

Auerbach's analysis is at once insightful, disingenuous and self-exculpatory. The network's growth imperative that he asserts is nothing but the digitized form of capital's intrinsic need to expand its circuit of profit constantly: M–M′. Auerbach looks forward to a meganet future as a version of Zuckerberg's 'metaverse' vision of online virtual realities. In his account, this will revolve around games and cryptocurrencies, formulae that will happily 'allow for the commodification of human life to a far greater scale than has yet been seen'.[45] There will be 'many more things to buy and new kinds of things to buy and therefore more money to be made'.[46] But, for Auerbach, given that meganets are inherently out of control, it is useless to try to regulate them or hold corporate owners responsible for their consequences. None of the tech CEOs, and certainly no software engineers, are to blame for the current state of the networks, he suggests. Rather,

meganets, following their own growth imperatives, will make decisions and display defects that are unpredictable and indeed humanly incomprehensible – and thus, Auerbach insists, impossible to mitigate.

There are, he acknowledges, some downsides to this – in particular, the tendency to create 'simplified and regularized' communities of people homogenized according to their buying habits.[47] The consequences, he concedes, are already visible in disinformation bubbles and social polarization. He even goes so far as to recommend occasional guerrilla hacker incursions on meganets, 'cultivating instability' and 'randomly injecting new elements' into them.[48] But this is as far as resistance can go. The 'semiautonomous' meganets will do – indeed, are already doing – their unstoppable thing.

We agree with much of Auerbach's analysis, but contest both his overall positivity towards digital commodification and the inevitability of the process he describes. The CCC is a formidable force that deepens the subordination of life to the dictates of markets. Just as industrial capitalism engulfed and assimilated the workplace, this process of 'subsumption' now extends digitally into planetary sociality and ecology.[49] Leveraging the powers of contemporary computation, the CCC amplifies and intensifies commodity exchange, exacerbating the inherently unstable relation between hyper-consumerism, volatile and precarious labour markets, and financial speculation by the elites of the corporate realm, leaving a chaotic ecological boot print as a ubiquitous sign of this expansion.

Our analysis of this circulatory system shares some aspects of other critical approaches to Big Tech, but also departs from them. We share the concerns raised by analysts focusing on the monopolistic powers wielded by tech giants, but we diverge sharply from the liberal perspective that sees regulation as the panacea. Regulation aimed at restoring the so-called free market mimics the very dynamics that propel the ascent of winner-takes-all corporations according to the logic succinctly articulated by far-right high-

tech entrepreneur Peter Thiel: ‘competition is for losers’.[50] Merely reshaping the digital sector into smaller, nimbler entities does little to address corporate gigantism and the systemic issues generated by Big Tech. The crux of the matter lies not only in the tendency towards monopoly, but also in the pervasive marketization facilitated by capital’s fundamental dynamic of commodity exchange, turbocharged by advanced technology.

Likewise, we agree with some aspects of the portrayal of Big Tech capitalists as rentiers, profiting primarily from the control of digital properties rather than direct commodity exchange, but we disagree with others. The view of Big Tech moguls as digital landlords offers valuable insight into operations such as Google’s and Facebook’s administration of virtual ad markets, Google’s and Apple’s control of app stores, and Amazon’s facilitation of third-party sellers in its digital emporium. But it is crucial to recognize that, in these instances, what is being rented out is access to markets: the on-ramps of virtual commerce. This dynamic underscores the enduring prevalence of commodity exchange, albeit now facilitated through a proliferation of cybernetic meta-market mechanisms. Thus, while the rentier control of digital properties by Big Tech is undeniable, it only exacerbates the intricacies of commodity exchange, rather than supplanting them.

As Timothy Erik Ström has pointed out, the metaphor of ‘techno-feudalism’, with its implicit imagery of barons and serfs, captures only part of the nature of cybernetic capitalism in an era of viral commodification, universal surveillance, micro-targeted advertising, blitz-scaling (a corporate strategy that prioritizes rapid growth over short- or even medium-term profitability) platforms, and cloud-computed hedge funds.[51] In this regard, McKenzie Wark’s proposition that capitalism is defunct, supplanted by a new regime of ‘vectoralists’ and hackers, possesses a certain daring appeal.[52] But this analysis confuses escalation and termination, conflating the breakneck acceleration of circulation with dissolution of the underlying

process. In confronting the epoch of Big Tech, the demise of capitalism seems a distant prospect. Yet our circulatory approach, with its emphasis on the circulation of social antagonisms and the havoc wreaked by digital capital on biospheric circulations, provides a framework for contemplating the realization of this task. Before we embark on such a journey, however, we must first look more deeply into the cybernetic workings of capital's circulation.

2

The Circulation of Commodities

If the CCC is about circulation, does this mean it is not about production? On the surface that would seem a preposterous claim. The CCC has extravagant headquarters, utopian research campuses, huge data centres, cavernous warehouses, bleak outsourced offices and crowded homework sites. Gathered in these places are thousands of employees and millions of dollars' worth of digital machines. As *New York Times* journalist Shira Ovide suggests, the CCC is a giant conglomeration of 'specialized equipment to assemble iPhones, hulking computer hubs and undersea internet cables that zip YouTube videos to your phone, and the warehouses for Amazon workers to assemble and ship orders'.[1] In 2021, General Motors promised to spend $10 billion to convert to production of electric cars, 'overhauling factories and investing in new projects like electric battery development'. Still, as Ovide notes, this is 'only about half' of what Facebook spends annually for data centres and other facilities.

So why do we focus on circulation and not production? Because the CCC produces circulation. The CCC *does* make something – usually software, algorithms, coded formulae executing computational actions. The most advanced of these algorithms perform tasks that typically require human intelligence, including understanding natural language, recognizing patterns and making decisions. This 'artificial intelligence' powers search optimization, voice assistance, image recognition, content personalization and other 'smart' technologies. At the moment they remain relatively narrow algorithms dedicated to a specific function, not the general,

versatile, human-matching intelligence of the science-fiction imagination – though, as we discuss later, large language models such as ChatGPT mark a significant expansion in their scope. Sometimes the CCC makes, or subcontracts the manufacture of the chassis, casing or vehicle in which their algorithmic software and AIs reside.

In the majority of instances, though, the CCC's software and hardware are designed to make money by, directly or indirectly, speeding the circulation of commodities. For a price, the CCC digitally smooths the passage of commodities towards money as they are sold by capitalists to consumers; or as workers sell the only commodity they may own – their labour power – to capitalists; or as investors, large and small, try to make money from money by playing the stock market. There are exceptions to this circulatory orientation – moments when CCC companies appear to be producing their own commodities for sale.[2] Often, however, these goods – an Amazon Echo or Google Nest smart home device, for instance – also prove to have a hidden circulatory function, furtively gathering data to assist in advertising and selling commodities to their owners.

As we will see, there are four key moments in the CCC's automation of circulation. The first is the passage of commodities into money, C–M – broadly, the area of advertising, logistics, shopping and marketing. The second is the storage and processing of information about sales and purchases, C–M–C, in cloud-computing data centres. The third is capital's buying of means of production and labour power, M–C(LP/MP), to maintain a 'gig economy'. And the fourth is the financialization that seeks to derive money from money, M–M′ – the scene of the mutual infatuation between Big Tech and Wall Street.

C–M: ADTECH, APPS AND AMAZON

The first phase of circulation is C–M, in which commodities are exchanged for money: in short, selling and buying. Advertising, persuading people to need and desire new goods, is fundamental to this phase. Today, thanks to the CCC, whenever you click on a digital link it creates an advertising opportunity: your data profile is instantaneously transmitted to an automated auction, conveyed via banks of computers linked by light-speed telecommunications. In real time, the electronic agents of 'publishers' – owners of digital space, most likely Google or Facebook – sell the chance to serve you a targeted advertisement to buyers competitively bidding against one another.

Between your initial click and the screen loading, the winning advertisement appears – an entry in a list of search results, a display banner on a social media feed, or an introduction to a streaming video or audio clip. This all takes 100 to 160 milliseconds, one to two tenths of a second – briefer than a blink – creating the creepy feeling of being 'followed' on the internet by ads that pre-cognitively anticipate your interests and longings.[3] Tracking, collection and commodification of online movement is essential to what Shoshana Zuboff calls 'surveillance capitalism'.[4]

AdTech, or 'programmatic advertising', is extremely lucrative: in 2020 its global revenues were estimated at $378 billion, more than $152 billion of which was spent in the United States – more than was spent on advertising on television, radio and newspapers combined.[5] Media scholar Lee McGuigan calls AdTech 'a major circulatory system of the so-called digital economy'.[6] AI researcher Tim Hwang describes it as 'the dark beating heart of the internet', so powerful that today 'the business of the internet is, by and large, an advertising business', whose 'highly automated, data-driven ecosystem … is the money machine that has fueled the meteoric rise of the most prominent tech giants and content creators of the modern era'.[7]

We think of Google as a provider of free search, email and maps, and of Facebook as a social media site. Yet both depend on digital advertising. More than 80 per cent of Alphabet's revenue, and 95 per cent of Meta's, comes from this source. Together, these two corporations have for a decade dominated digital advertising in North America and around the world. If this duopoly is now being challenged, it is only because other CCC giants such as Amazon and Apple, and smaller entrants like TikTok, are edging into the business.[8] It is the ubiquity and popularity of the free services offered by the CCC giants, supplemented by information purchased from third-party data brokers, that enables them to construct profiles of habitual users' age, gender, consumer tastes, cultural interests, sexuality, politics, location and movements – and it is these profiles that make targeted advertisements profitably auctionable.

Advertising-based surveillance is so central to some CCC corporations that rival oligopolists weaponize the issue against them. Apple itself pioneered important technologies for tracking network users. But after Edward Snowden's 2013 revelations of CCC's complicity in the NSA's digital surveillance of US citizens, Apple positioned itself as a pro-privacy company. In 2021 it announced a policy of 'app-tracking transparency', by which users of the latest version of the iPhone would be required to give explicit permission for Facebook to allow apps to track their digital activity on other websites. The resulting decline in income nearly shattered Meta's finances. Apple exploited privacy as a luxury feature available to affluent iPhone users: it is omnipresent CCC surveillance that allows it to sell such protection back to elite customers.

Much public alarm about the CCC focuses, rightly, on its issues of privacy invasion and identity theft. But in digital capitalism, selling and surveillance are two sides of one coin. Surveillance technologies, including those that state security systems now wield, would not exist in their current form without the commercial impetus of digital advertising. Conversely,

advertising could not function as it does without the compilation of microtargeted demographic-psychographic-behavioral profiles. It is the relation between these two components that creates the first and most important of the feedback loops by which the CCC steers itself – between harvested user information and a stream of advertising-bearing content reinforcing consumer preferences and accelerating purchasing behaviour.

A second circulation accelerator is the smartphone, with its endless feeds and myriad apps. When, in 2007, Apple's iPhone made mobiles 'smart' by giving them internet connectivity, it became 'the fastest-selling gadget in history', and a basic building block of the CCC.[9] Google, fearing for its search business, responded by releasing its own Android operating system to phone manufacturers, and both Apple and Google populated their devices with software applications via the App Store and Google Play, on which third-party developers could sell apps – microprograms layered on top of smartphones' operating systems.

The smartphone can be many things, but it is above all a shopping device: a commodity that circulates other commodities. On the App Store and Google Play, apps can sell as commodities (for example, games) but are often free, to encourage sales later, or as a vehicle for paid advertisements. Meanwhile, 'freemium' apps give away some content, perhaps accompanied by advertising, as a means of eventually drawing users into purchases. With or without users' permission or knowledge, apps frequently extract data for digital advertising. Mobile apps are now a major point of entry to Instagram, TikTok, Facebook, WhatsApp, Snapchat, and other advertising platforms that consistently top lists of global app downloads.[10] Apps thus create a multilevel stacking of commodification processes from sales, advertising and data extraction.

Vincent Manzerolle and Atle Kjøsen vividly describe how the smartphone and its apps make the market 'no longer a place but a field'.[11] Designed to be 'always on', and always on your person, smartphones

signify ‘the change from a push economy to a pull economy’.[12] In an ‘inversion of polarity’ in the movement of circulation, money no longer has to search out commodities, as it does when confined to someone’s wallet. Rather, ‘commodities can seek out money’ in micro-targeted advertisements, offers and instant purchase options transmitted directly to a shopping device which ‘connect[s] all objects into potential communicative nodes within a vast … mesh of human and machine subjects’.[13]

Via this mesh, they write, ‘commodities can in principle be transmitted directly to individual consumers wherever they may be in the world’.[14] As they stress, apps and smartphones (alongside other digital devices) now clinch the all-important moment in circulation’s C–M phase: payment, conducted not just by already familiar credit cards, but by a new array of exchange mechanisms, including Apple and Google’s own proprietary payment systems, and those of new specialized CCC participants such as PayPal. This is now where money changes hands, except there are no hands involved.

The third moment in the CCC’s mediation of market exchange is Amazon – if for a moment we let the name of Bezos’s company stand for the digital reworking of retailing and logistics it exemplifies. Amazon animates what Marx termed ‘merchant capital’ – capital that acts not as producer, but as ‘a mechanism of control over the exchange of products for money’.[15]

Amazon was initially merely a conventional online retailer, selling stock received from commercial suppliers. It was its ‘1-click’ ordering system, patented in 1999, that transformed e-shopping from the time-consuming chore of filling a virtual shopping cart to something seductively easy, while also gathering consumer information, affording Amazon its own capacity for surveillance advertising (a.k.a. ‘recommendation’). But the success of ‘1-click’ prompted a further innovation: Amazon Marketplace, a ‘digital emporium’ for third-party companies that pay Amazon a commission.[16]

Amazon thereby moved from marketing goods to *becoming* the marketplace – one notorious not only for self-preferencing in advertising, but for copying other vendors' products. Amazon is now a massive, complex corporation. It produces, through subcontracting, some of the commodities it sells, including electronic goods such as the Kindle e-reader and Echo speakers, armed with the voice assistant Alexa. It has its own film studio producing for Amazon's Prime streaming subscription service and runs the live-gaming platform Twitch. However, it is Amazon's commanding position in online retailing that has enabled it to move outwards into other areas on the circuit of capital.

This position is based not only on Amazon's smooth virtual interface, but also on the very physical labour process a 1-click order sets in motion. In the opening lines of *Capital*, Marx writes that the wealth of capitalist societies presents itself as 'an immense heap of commodities'.[17] Today, we know exactly what this heap looks like. It takes the form of the 'pick tower' in an Amazon warehouse. The pick tower is the multi-floored section central to Amazon's football-field-sized fulfilment centres, in which goods – laptops, books, toys, shoes, vitamins, ornaments, clothes, bathtubs – are stashed between arrival and dispatch. This heap of commodities-in-circulation, on the way to their translation into money, can only be navigated by machines. For while a pick tower's lattice of shelves presents an outwardly orderly appearance, its organization of commodities is intentionally chaotic.

To optimize the use of space and speed of access, while eliminating the need for planning for objects of varying size and shape, Amazon abandoned storing similar items together. There is no area just for books or televisions, as there would be in a normal retail store. Instead, human 'stowers' stuff items onto unoccupied shelves where they will fit in an otherwise random distribution, recording a barcode for the shelf and item on a digital scanner, or 'gun', that directs and measures every aspect of labour in the warehouse.

Whenever ‘pickers’ enter the tower to retrieve an item, they download data resulting from this labour to their scanner, which directs them to its nearest location. In the pick tower, a human without a digital prosthesis is lost.[18]

The unification of human labour and machine control effected through the Amazon worker’s data gun is a digital intensification of Taylorist and Fordist twentieth-century managerial practices. ‘Bezosism’ does not dispense with human labour; in fact, Amazon is the second-largest private employer in the United States today.[19] Rather, Amazon retains the vital but cheap component of human dexterity within a system whose pace and priorities are dictated through cybernetic automation.

In Amazon’s early days, pickers would spend hours walking, miles per shift, very fast, through pick towers to collect orders. In 2012, however, following a Christmas order–fulfilment crisis, Amazon purchased the robotic company Kiva, and began sending its small, flat automata scuttling into some distribution centres to bring shelves from pick towers to stationary pickers, thereby saving not only on labour-time, but also on space and the costs of cooling, heating and light. But the resulting increase in efficiency has heightened stress on workers, who are now required to perform repetitive tasks at a pace matching robotic throughput; failure to maintain digitally monitored rates results in automatic, algorithmically notified dismissal. These conditions have inspired waves of worker unrest; the slogan ‘We are not robots’ is prominent in unionization drives, as we will discuss later. Such automation invites obvious comparison with that of industrial factories. But there is a difference: factories were fortresses of production, while Amazon’s warehouses, and those of the scores of logistic companies that strive to emulate them, are cathedrals of circulation, where, in the words of Charmaine Chua and Spencer Cox, workers ‘produce nothing and deliver everything’.[20]

The flywheel of this mechanism is an increasingly computational system using machine learning and artificial intelligence to link customer ordering,

profiling and predictive recommendations, inventory management, supply-chain control, smart home devices and delivery systems.[21] This system backs the immensely popular (and ecologically destructive) ‘arriving today’ option of express doorstep delivery to paid subscribers to Amazon Prime. In 2022, Amazon, which already had elaborate technologies of navigation, scheduling and surveillance installed in its transport and delivery fleet, promised the beginning of drone delivery in some parts of the United States. In the meantime, Amazon investigated further cyborg possibilities. In 2018 it filed a patent for a wearable system that would electronically ‘nudge’ – or shock – the hands of warehouse pickers to guide them more quickly to target commodities.[22] Even before that, in 2013, it had already filed a patent for an ‘anticipatory delivery’ system that would, in specific circumstances, predictively dispatch goods to customers in advance of an actual order, thereby arguably reducing circulation time to less than zero.[23]

C–M–C: THE CLOUD IN THE OCEAN

Online shopping is central to Amazon’s business model – but its most profitable sector lies elsewhere. In 2006, Amazon Web Services (AWS) began renting its excess computing capacity to other corporations, thereby inventing the business of cloud computing. Since then, ‘the cloud’ has expanded into a huge and competitive market. In 2022, AWS remained the leader, claiming just over a third of the sector, but closely trailed by Microsoft, and more distantly by Google.[24] To compete in cloud provision, CCC giants have constructed huge data centres in which tens or hundreds of thousands of servers hum ceaselessly in air-conditioned chambers, storing and processing petabytes of networked transmissions.

In urban areas, small data centres are discreetly tucked away in nondescript brownstones or office high-rises. However, security concerns and the need to access cold air and plentiful water to cool constantly

running computers mean that large data centres are often located in strange and remote places: disused Cold War nuclear bunkers; close to the Arctic Circle; buried deep inside mountains; beneath medieval cathedrals. Though usually staffed, they are highly automated. Microsoft submerged a data centre for its Azure cloud service on the sea floor close to Scotland's Orkney Islands. For two years, the giant server pods functioned successfully without a human crew, the lack of oxygen apparently boosting their performance.[25]

Cloud computing is conventionally described as business's answer to the problem of Big Data – the exponential escalation of the volume, variety and velocity of digital information flows. Big Data is capital's cybernetic record of its own cybernetic circulation, the data exhaust from its accelerating progress around the spiralling course of C–M–C. As Jathan Sadowski explains, this data is subject to a feedback loop.[26] Improved computational capacities to record and measure commodity exchange – from point-of-sale records to social media consumer profiles – require more computation to make this information intelligible and interpretable. Big Data is capital's 'data double', the fluctuating self-image created by constant digital tracking of its own activities. It is capital's ghost in the machine, and the machine is the data centre. We position our discussion of it here, at the midpoint of our travel around capital's circuit, between advertising, sales and shopping (C–M) and the purchase of workers and machines (M–C) and financialization (M–M′), to suggest the moment at which data from the entire circuit founded a new, CCC-created industry.

Cloud computing is used by corporations of all types today. Circulatory sectors, such as banking and retail, were earlier adopters than industrial companies, but its use among the latter is now widespread.[27] Microsoft does not reveal the full list of clients of its Azure cloud-computing service, but it reportedly includes Airbnb, Coca-Cola, Dell, Expedia, General Motors, Hilton, Nike, Oracle and Starbucks. In 2021 it announced the

rollout of a financial-services cloud for clients such as Morgan Stanley and HSBC. Whether a company is in retail, manufacturing or services, it will use cloud computing to store transaction records, inventory data, and human-resources information. Data related to customers – such as purchase histories, personal details and recorded interactions, sales campaign documentation, and opportunity tracking – are frequently processed. So too are financial records, covering everything from payroll to revenue and expense records. There are voluminous records of IT activity: system logs, error logs, access logs, performance logs; network traffic and usage data; backup and recovery data; software licenses and configurations. And all of this is still only a fraction of the data sucked up into the cloud.

But cloud computing is not just a matter of passive data storage. Cloud capitalists such as Amazon, Microsoft and Google ‘centralize a wide range of resources, bundle them in new ways, and rent them as a service’.[28] These processes make the data centre not so much a data locker as a data factory. So-called ‘data warehouse’ programs like Amazon Redshift, Google BigQuery and Azure Synapse Analytics offer fast, complex ‘query performance’ across vast datasets. Companies rent these instruments to track sales trends and predict potential top-performing products based on historical data, to identify customer purchase patterns and segment them for targeted marketing, to trace supply-chain bottlenecks and inefficiencies, to run fraud-detection programs; to assess clinical trials and prototype tests. Specialized programs orchestrate container-transport systems. Other services deal specifically with streamlining and expanding clients’ own corporate computational capacities, enabling machine-learning tools or the programming of serverless software.

The cloud offers not only an analysis of markets for corporations, but also a way to act on such analysis. For customers of cloud giants, the initial appeal of transferring computing out-of-house was to save on the costs of equipment, buildings and IT workers. But now the attraction is not just that

of outsourcing technical staff, or strengthening cybersecurity, but above all scaling: that is, creating an organizational ability to make rapid changes in computing capacity in the face of sudden shifts in market conditions, such as a pandemic or economic crash. Scaling makes corporations ‘agile’ – able either to add or to shed computing power as needed. This capacity is especially valued by companies trying to exploit ‘network effects’ to dominate some emerging market. Netflix’s initial success in online video streaming is frequently attributed to the rapid shift not just of its customer-facing services, but also its billing infrastructure and cybersecurity, to AWS cloud services, which gave it a global distribution in 130 countries.[29] So important is this consideration that cloud-computing suppliers are often referred to as ‘hyperscalers’.[30]

In the cloud, computing capacity is flexibly portioned and assigned over the provider’s total ensemble of machines; it is a ‘virtualized’, ‘abstracted’ and ‘liquefied’ power. This power is today part of what Marx termed the ‘general conditions of production’ – the basic systems of communication and transportation that, in any specific era, are taken for granted as available (at a price) for making and distributing goods and services.[31] Marx had in mind roads, tunnels, canals and eventually railways and the telegraph, all of which constituted the infrastructures for capital’s industrial revolution. By the twentieth century, this infrastructure took the form of highways, air and sea cargo, broadcast media, and indeed the electricity supply required to keep factory assembly lines moving. In the twenty-first century, digital networks are general conditions of production, and their concrete manifestation is the data centres in which digital traffic converges for cloud computing. While the ‘general conditions of production’ are in a way commonly available, their provision today in the form of cloud computing is highly profitable for an extremely narrow class of capitalists.

Capital, having profited from the sale of the commodities it produced, reinvests some of that money in the purchase of other types of commodities (C) – equipment, the means of production and workers' labour power. And in this M–C(LP/MP) phase, too, the CCC is energetically involved. We will not discuss the CCC's role in providing other capitalists with means of production, because it is very obvious. Microsoft, producing software, and Apple, making laptops, tablets and iPhones, are the most famous founding corporations of the US and global computing industry, and continue to be powerhouses within it. Microsoft dominates mega-corporate computing – 'Office' clearly designates the target market – and Apple's high-design machines are a must for professional or self-employed creatives.

Of course, computers are multipurpose devices, used for work and/or play. More remarkable and controversial than the ubiquitous use of networked computing are the new ways of acquiring labour power that this collapse of boundaries has offered to capital. Writing during the early days of internet adoption, media scholar Tiziana Terranova was quick to highlight the importance for digital commerce of unpaid user activities – hosting 'chat rooms' or curating fan websites.[32] Internet capitalists were, she suggested, bypassing the need to hire workers by benefiting from 'free labour'. This thesis – although echoed by thinkers like Christian Fuchs and Tim Jordan – has been widely debated. Critics point out that social media use lacks the coercive discipline characteristic of work, and object to the apparent suggestion that making and watching TikTok videos is equivalent to the grinding toil of, say, Amazon workers.[33] Today, scholars such as Nick Srnicek discussing network-user exploitation prefer the metaphor of 'data extraction', in which platform populations appear not as unpaid workers, but as a passive natural resource drilled to obtain this new 'raw material' that, 'just like oil' can 'be extracted, refined and used in a variety of ways'.[34]

Yet the ‘free labour’ thesis is worthy of reassertion. Terranova never equated social media use with paid work, but rather posited it as a new modality in capital’s appropriation of surplus from labour. Data extraction can only occur because users are not passive, but active: logging on, posting, playing, socializing and creating. The conversion of this activity into capitalist value – monetization – certainly demands complex, layered mediations, through the paid work of technicians and moderators, and sale and purchase of online advertising. Yet the recent development in partially paid and precarious networked labour shows how thin the line separating users from workers has become, and how the CCC serves capital with a menu running from free labour to gig work in the M–C(LP) phase of circulation.

This is illustrated by the rise of the digital ‘influencer’, the job most desired by thirteen-to-thirty-eight-year-olds in the United States, according to one market research study.[35] An influencer is a micro-(and sometimes macro-)celebrity with a substantial social media following (10,000 followers is a common benchmark) who parlays this popularity into various forms of income.[36] These payments can take the form of revenue-sharing arrangements with advertising platforms, such as YouTube and Facebook, which now direct significant funds to such user-generated content; the influencer’s own crowd-funding efforts; or sponsorships from brand companies, which prize the ‘authenticity’ of influencers’ ‘mentions’ in lifestyle presentations. Sponsorship arrangements may be monetary or in-kind – trips, gifts, samples. Influencers usually focus on specific themes – fashion, games, food, design, beauty, fitness – though some have a cult of personality reaching across multiple domains. Influencers escalate AdTech targeting, creating a multiplication of the micro-industries – one-person media factories – that proliferate within the giant and medium-sized platforms, energetically generating the ethos of what Hund and McGuigan call ‘a fully shoppable world’.[37]

Influencers contribute to the acceleration of the conversion of commodities into money (C–M), but as ‘self-employed’ workers they receive money for their labour – M–C(LP). A tiny minority of top-rank influencers are multimillionaires; some have incomes roughly comparable to other precarious culture-industry performers, while a long tail of low earners barely cover their production costs, and many make a loss, subsidising their ‘influencing’ with other work.[38] Success depends on a gruelling production schedule, technical aptitude, and constant performative self-presentation.[39] Influencers tend to describe themselves as entrepreneurs, yet are dependent on the CCC platforms such as YouTube, Facebook, Instagram and/or TikTok. Changes to algorithms governing a site’s internal ranking and visibility behaviour can make or break an aspiring influencer. Conversely, ‘gaming’ the algorithms is an influencer preoccupation, sitting somewhere between ambitious self-optimizing business practice and worker resistance to corporate power.[40]

Influencers’ rewards depend on the number of their followers. Many rent bots, purchasable from so-called bot farms, to multiply hits and likes.[41] This is officially frowned upon by CCC corporations, which occasionally purge bots. But, since platforms’ market values also depend on user numbers, and advertising agencies’ success on client visibility, a shared interest in silence on the matter tends to obscure this automated self-cannibalization in AdTech – a striking demonstration of the permeability of the line between users and workers in the CCC.

A more formalized arrangement of such labour is Amazon’s Mechanical Turk. Named after an eighteenth-century chess-playing ‘automaton’ (which in fact contained a hidden human operator), MTurk was originally intended as a way for Amazon to outsource its internal routine work. In 2005, it became a website allowing any business or individual to hire remote workers to perform on-demand online jobs, marketed by Bezos as ‘artificial artificial intelligence’ – suggesting that ‘Turkers’, those worker-customers

who use the platform, execute routine tasks at speeds and prices emulating superhuman machine performance. Such Human Intelligence Tasks (HITs) include photo tagging, product categorization, transcription, translation, market and sales research and the completion of online surveys.

In MTurk, the company writes, 'HITs are created by Requester customers in order to be completed by Worker customers.'[42] The Turkers browse postings on the site and bid to complete them in exchange for a fee set by the 'Requester customers'. Amazon charges requesters fees and commission, thus extending its role as a merchant capitalist to selling the commodity labour power to firms or individuals shopping for temporary workers. Because it does not actually employ MTurkers, it bears no responsibility for their equipment, training or working conditions. MTurk currently appears to draw its online labour pool mostly from within the United States, and while there is some dispute about the level of Turker earnings, they clearly fall below legislated minimum wage rates for a regular job.[43] Other companies, such as Clickworker, CrowdFlower and Upwork, have been quick to seize on the model Amazon set and apply it globally.

Such click-work typifies the gig economy – casual, part-time, free-lancing and precarious employment dissolving what, at least in the Global North, was once considered the 'standard' employment contract, with regular hours, pay cheques and benefits, and a long-term relationship between employer and employee. It thus signifies a change in capital's organization of the M–C(LP) part of its circuit. In their admirable overview of gig work, Jamie Woodcock and Mark Graham describe two main routes it can take: online 'untethered' work, arranged and performed online so that it can hypothetically be carried out anywhere on the planet and across different time zones; and 'tethered' gig work, where a digital platform matches a service consumer with a supplier at a specific place and time.[44]

Tethered gig-work arrangements are typified by ride-hailing company Uber, so much so their adoption is often called ‘Uberization’.[45] Uber is among a cluster of companies, such as Twitter, TikTok and Netflix, often listed as honorary members of Big Tech, because though smaller in market value than Meta, Apple, Microsoft, Amazon and Alphabet, they exemplify in various ways capitalism’s latest digital applications. Uber’s whole business model depends on its claim to be a ‘tech’ company, not a taxi business. At its centre is its Michelangelo AI, through which Uber routes customers’ calls to drivers, monitors driver performance, and nudges drivers and customers alike with ‘surge pricing’ and other algorithmic prompts. Uber defines this system not as an employment mechanism but as an intermediary platform, merely coordinating the transaction between atomized sellers and buyers of labour power. According to this story, Uber is not paying the driver (C–M), but rather using its AI to arrange a sale, from which, as match-maker, it takes a cut (immediately and automatically deducted from the driver’s payment).

In this way, Uber has become the classic, and controversial, case of a company that denies having employees. Its drivers are ‘independent contractors’, thereby avoiding costs and responsibilities not only for insurance, holiday pay, minimum-wage rates and health benefits, but even for providing the most basic equipment: Uber drivers supply their own cars. It exemplifies what Nick Srnicek terms ‘lean platforms’, whose business model supplants competitors by lowering C–M costs, for both workers and machinery, to a minimum.[46] This is a model of gig work that has spread far and wide with the Uberization of food delivery (Deliveroo, Postmates, DoorDash), household repairs (TaskRabbit), domestic cleaning (TIDY), and other services, and is spreading into areas such as healthcare (Gento).

Yet, behind the apparent hypermodernity of both cloudworking and Uberization are far older capitalist practices of piecework, in which the employee is paid not on the basis of an hourly wage, but only for the

completion of discrete tasks in which a merchant-capitalist subcontracts tasks to workers to complete in their own homes with their own tools – a system that became notorious for low pay and desperate overwork. Its return today is enabled by automated network processes that remove the need for fixed spatial and temporal boundaries – a fixed workplace and specified hours of work – that have conventionally defined waged work. The enterprise defines itself solely as a fee-taking intermediary linking the seller and buyer of labour power, and the worker is similarly redefined as self-employed – a petty capitalist. But, at the same time, computational monitoring power creates a depth of surveillance that allows 'algorithmic management' of task completion.

There is controversy about the scope of gig work. Some labour analysis suggests its extent is overstated, usually by enthusiastic advocates of the freedom and flexibility such arrangements supposedly bring. This exaggeration overlooks how many workers labour in regular jobs, suffering conventional problems of low wages, long hours and lack of control over their working conditions. Some gig work is adopted to supplement incomes from such regular jobs. But it is also apparent that forms of platformed work organization are spreading across a number of sectors. The tendency of the CCC's influence on the M–C(LP) transaction points to capitalists' increasing ability to summon workers only when they need them, and with minimal responsibility towards them, creating a flexibility and fluidity for capital that amounts to what the Brazilian political economist Gil Felix describes as the 'super-circulation' of labour power.[47]

M–M′: PEARS AND APPLES

So capital follows a circuit, leading to the point where the capitalist, having made money (M′), starts again, buying machines and raw materials to make more commodities … But wait: there is a fork in the road, a bifurcation in

the circuit's final stage. For the deep dream of capital, Marx suggests, is to skip the messy business of actually producing things and jump straight from money to more money: M–M′. The CCC strives to create the conditions for precisely this fulfilment.

How can capital get straight from M to M′? The traditional route is through the loaning out of money for interest, buying shares in the stock market, or engaging in other forms of financial speculation. Marx called such practices 'fictitious capital' because they derive their value from the *expectation* of future profit or income. The ability to make gains by trading on these anticipations of profit makes it seem that it is 'as completely the property of money to create value … as it is the property of a pear tree to bear pears'.[48] However, this promise may not work out. For Marx, the real source of value remains the surplus labour extracted in production. This form of value must ultimately back up interest from loans, or the price of stocks. And there are more than enough instances of financial crashes when this fails to happen, some of which have shaped the CCC.

The dot-com bubble of 2000, for instance, was inflated by venture capital (VC) a high-risk, high-reward form of investing that jumps in at the very early stage of a company's existence, loaning otherwise inaccessible funds in return for a minority ownership share. If this strategy succeeds, the venture capitalist makes many times the return yielded by conventional investing; but if the company fails, they lose their entire stake. Hundreds of VC-funded experiments in networked business have emerged – ranging from publishing to pornography and pet food delivery. As startup IPOs saw their stock prices soar, euphoria reigned about the so-called new economy. But when it became apparent that many of these ventures lacked a business plan, and that their promises were based on folly or fraud, the NASDAQ, the US tech stock exchange, having peaked at 5,048.62 points on 10 March 2000, had plummeted by 4 October 2002 by 77 per cent, to a low of 1,139.90 points.

When digital capital finally crawled out of this smoking crater in the mid 2000s, it was backed by investors with a sterner eye to their financial bottom line. But the speculative aura of the CCC has never completely faded. It was the rising share prices of five companies – Google, Apple, Facebook, Amazon and Microsoft – that, around 2013, prompted business pundits to dub them ‘Big Tech’. And it was market capitalization – a quintessential measure of fictitious capital, based not on actual profits or revenues but on stock-market prices – that declared these companies the most valuable in the world.[49]

Another turning point came after the Wall Street crash of 2008, when the Federal Reserve’s low-interest-rate policies made it hard to make money from money. Returns on government bonds were low, and individuals and institutional investors turned to the tech industry in an effort ‘to find profitable outlets for their capital’.[50] The CCC was now of interest to larger financial entities: asset management companies. These companies – Vanguard, BlackRock, State Street, Fidelity and T. Rowe Price, all based in the US – make money by pooling client assets into colossal investment funds. They rapidly became investors in the Big Five tech companies, but asset managers did not directly command business decisions. Founders, such as Sergey Brin and Larry Page at Google, and Mark Zuckerberg at Facebook, often still held a majority of shares, while asset managers often held only special non-voting shares. But their presence meant that the interests of investors who regarded Big Tech companies primarily as share-price vehicles would encourage a process of ‘financialization’.

Rodrigo Fernandez, Ilke Adriaans, Tobias Klinge and Reijer Hendrikse describe ‘corporate financialization’ – a tendency common throughout capitalism today – as a ‘process through which publicly-listed companies aim to inflate their stock prices … increasingly partaking in practices that have been the domain of the financial sector’ following an ‘underlying principle of *shareholder value maximization*’.[51] The authors identify three

moments in the process. First, companies themselves hold a high ratio of financial assets relative to their investments in machinery, offices or factories. Second, they use this liquid capital for mergers or acquisitions, shoring up monopoly power. Third, they use gambits such as share buybacks to strengthen the position of shareholders, including those of owners, managers and elite employees.

While there are variations among the CCC corporations, they generally fulfil these three conditions. The giant tech companies tend to hold large cash assets as well as stock portfolios: they are not just objects of investment, but themselves investors making money on shares and bonds. They also buy other companies. Between 1988 and 2021, Apple purchased 123 firms. Amazon started a decade later, but by 2021 had bought 111 companies. Google bought 268 companies between 2001 and 2021. Facebook got going in 2005, and by 2021 had notched up 105 buys.[52] These practices produce the concentrations of ownership discussed in Chapter 1. And many of them periodically buy back their own shares, reducing the number on the market, thereby bootstrapping a rise in the value of their own stocks. Buybacks are especially useful to tech companies because they often pay managers and full-time staff with stock options, making buybacks a way to reduce the need for salary increases and staff loyalty.

Financialization introduces another feedback loop into the growth of the CCC, strongly propelled by investors' sense of 'futurity'.[53] As we have seen, a company's value is often reckoned by its market capitalization – the number of its traded shares times the current price. Investors tend to favour companies with a large and growing market capitalization, buying more shares and driving up the price, thereby further increasing market cap. This process is self-perpetuating – a strong market valuation gives capitalists funds for investments, or makes it easier to raise money; but it also injects a strong circularity into the growth dynamic. In the case of the CCC, this is

multiplied by network effects, or the idea that a platform or site becomes more valuable as its user base increases.[54] The potential value inherent to network effects may induce investors to endure long years of little or no profit in a company based on faith that, despite its losses, it is squeezing competitors out of the market, as Bezos did successfully, and Uber has been attempting to do for years.

In the case of the CCC this circularity is increased, because the very technologies it develops make it easier for capitalists to analyse diverse, previously segregated markets for fictitious capital – debt, stock, bonds – to manipulate this information in new and profitable ways. Some of these technologies – such as high-frequency trading conducted by swarms of bots – were developed on the Silicon Valley electronic-trading NASDAQ exchange by Wall Street's own technology-oriented quantitative traders ('quants').

With the rise of Big Tech, however, ever more of this financial instrumentation was being provided by the CCC. By 2022 Amazon was supplying the cloud-computing platform that NASDAQ ran on. Meanwhile, Alphabet had announced that the Google Cloud Platform would be the new home of CME, one of the world's biggest derivatives exchanges, and Microsoft Azure was trumpeting the rollout if its financial services cloud, whose users would include grand banks such as Morgan Stanley and HSBC.[55] Partly as a result of the availability of the computational power required for arcane, complex, predictive and probabilistic calculation, there has been, according to the economist Cédric Durand, 'a dizzying growth in the quantity of value validated in anticipation of commodity production'.[56] In derivatives markets, where investors gamble on the movements – up or down, win or lose – of other underlying financial assets, wagering on the movement of stocks, currencies or interest rates, capital's greatest fortunes now hinge on bets on bets on bets: M–M′–M″ …

This circular relation between the CCC and finance capital manifests in a number of ways. As Timothy Erik Ström points out in his trenchant overview of cybernetic capitalism, BlackRock, the asset-management company that is a significant investor in the CCC, runs its own business through its prodigious Aladdin database, which tracks companies' financial performance.[57] In Aladdin, AI is 'used to read each of the reports, and then feed various upgrades, downgrades and analyst insights directly to its investment teams'.[58] BlackRock also rents access to Aladdin to clients. According to a *Financial Times* report 'Apple, Microsoft, and Google's parent firm, Alphabet – the three biggest US public companies – all rely on the system to steward hundreds of billions of dollars in their corporate treasury investment portfolios.'[59] CCC corporations thus not only have asset managers in their boardrooms but also use those managers' tools to direct their own investments.

Conversely, since 2018 Apple has run its own investment company – one of the world's largest, Braeburn Capital. It is a wholly owned subsidiary that manages a $244 billion financial portfolio – 70 per cent of Apple's assets – and is backed by a further $115 billion of debt. Owners of Apple shares are de facto investors in Braeburn, making Apple something of 'a hedge fund that makes phones'.[60] Meanwhile, amid a vast resurgence of venture capital funding prompted by the CCC's success, the Big Tech companies have themselves all become VCs – a field in which there is not only sharply increasing interest in funding AI startups, but nearly equal enthusiasm for applying AI to the processes of selecting startups that VCs will back, creating the 'algorithm as a venture capitalist'.[61]

The most ambitious Big Tech financial scheme – Zuckerberg's plan for a Facebook cryptocurrency, variously named Libra and Diem – has, at the time of writing, ingloriously fizzled out for lack of wider corporate support. Nonetheless, the increasing overlap between the CCC and the financial sector has created a growing anxiety among bankers that tech companies

might stop being their best, biggest customers, and that they will instead themselves *become* banks.[62] Many regard a CCC takeover of financial institutions as 'not a question of if but when'.[63] But the jury remains out on how close the CCC is to breaking into banking. While Apple, Google and Amazon continue to generate systems for payments and debt, they have not overwhelmed traditional credit cards; no single big gambit from digital capital has shattered existing financial systems. Indeed, Apple and Amazon collaborate with established players, such as Goldman Sachs and Mastercard. The day when Facebook – or, perhaps more plausibly, Apple – takes over the Federal Reserve Bank may therefore be postponed. Yet the definitive contribution of the CCC has been to establish the capacity of the digital screen to circulate money, turning it into more money, much as it is 'the property of a pear tree to bear pears' – or perhaps that should be 'of Apple to bear Apples'.

WORLD MARKET

We have tracked the CCC's role in automating the circulation of commodities through all its phases. This circuit expands to encompass the whole planet, creating what Marx called 'the world market'. Marx wrote – often enthusiastically – about the way capital's media and transportation systems spread a web of 'universal intercourse' around the globe.[64] But while Marx saw this as a generally progressive tendency, giving workers opportunities to unite in opposition to capital, his later work shows an increasing awareness of the colonial dispossession and exploitation associated with this vast apparatus of movement and communication.

These contradictory tendencies continue today in what is referred to as 'globalization'. The affluent world remains, as a recent celebratory account of influencer culture puts it, 'extremely online'.[65] As of 2023, approximately 92 per cent of people in the United States accessed the

internet. Connection rates in Europe are broadly similar.[66] But globally only some 66 per cent of the global population used the internet in 2023.[67] This still excludes a third of the world's people; digital divides of all kinds persist. Nonetheless, across the poorer segments of the world market, from Hanoi to Bogotá, fast adoption of mobile phones is very rapidly extending network use. China is a digital titan with billion-user super-apps, allegedly subverting Western security with its TikTok videos and Huawei networks. Capital's infrastructure builders, platform owners and cosmopolitan content creators all salivate in anticipation of 'the next billion users', enabling the planetary scope of the network of networks to expand yet further.[68]

The CCC has been crucial in this global scaling of capital's circuit. Facebook, with 2.96 billion monthly active users, is the leading social network in 157 out of 167 countries (94 per cent).[69] Google is used in over 90 per cent of global search queries. Microsoft and Apple products are sold across the globe. Microsoft has Azure data centres in over 160 locations in thirty-five countries, spread across the Americas, Europe, Asia-Pacific, the Middle East and Africa. Outside the United States, Amazon also operates fulfilment centres in some thirteen other countries, including not only most European nations, but also Mexico, Brazil, India and Japan.[70]

In many countries there are also domestic commercial platform providers that mirror the services provided by the CCC, which for cultural reasons may be favoured by local users. Thus, South Korea's Naver parallels Google, and is the country's most popular search engine, while KakaoTalk is a messaging/social program comparable to WhatsApp. Facebook is the most popular social media platform in Vietnam, but a local startup, Zalo, is runner up, and Google's dominance is challenged by the domestic search engine Cốc Cốc. But the US firms have a powerful global presence. In Brazil, an apparently local social media platform popular in the early 2000s, Orkut, was in fact a subsidiary of Google until it closed,

supplanted by WhatsApp and other Meta platforms. In India, social media are dominated by Meta's trio of Facebook, Instagram and WhatsApp.

Planetary cybernetic circulation has therefore been shaped by a collection of US corporations with global reach. Much of the world's experience of digital commodity circulation is now controlled by foreign companies. For this reason, critics like Michael Kwet and Dal Yong Jin describe their expansion as 'platform imperialism' and 'digital colonialism'.[71] In Jin's words, there is 'an asymmetrical relationship of interdependence between the West, primarily the US, and many developing countries [that] is characterized in part by unequal technological exchanges and therefore cultural and capital flows'.[72] More recently in the Global South, social activists of the Tricontinental Institute for Social Research have identified control of digital technologies as a key factor in a new 'hyper-imperialism' dividing the world into a multilayered regional hierarchy of wealth and power.[73] The media scholars Ulises Mejias and Nick Couldry, working with social movements of the Tierra Común Network, speak simply of 'the new colonialism of Big Tech' as a 'data grab' – that is, a land grab of 'digital territories'.[74]

There are many dimensions to digital colonialism. One is data extraction. The planetary pre-eminence of Facebook and Google means the record of detailed surveillance of many countries' online populations is held by corporations headquartered outside their boundaries. This has enormous implications not only for economic power, but also for military dominance. As we have seen, the internet originated in Pentagon research; Silicon Valley was built on military contracts.[75] And while the new digital networks were only one part of the Cold War with the Soviet Union, in Southeast Asia they were deployed in the catastrophic US hot war against communist insurgency, in which computerized command centres in the jungles of Thailand directed B-52 raids on Vietnam and Cambodia. The revelations of whistle-blower Edward Snowden show that these military– corporate

connections persist in the twenty-first century, when CCC companies have compliantly surrendered user data to the premier US international espionage organization, the National Security Agency – a major actor in cyberwar operations. In Chapter 4, we will discuss the involvement of the Big Five and lower-tier CCC companies in lucrative military projects, including the wars in Ukraine and the Middle East.

While China and Russia have their own cyberwar capacities with which to counter US digital power, smaller, poorer nations are almost defenceless against digital espionage, surveillance and black ops. Such activities are not only conducted by the official agencies of the US security state, or the Anglosphere's 'Five Eyes' intelligence-gathering alliance (the US, the UK, Canada, Australia and New Zealand). They are also conducted by mercenaries. The Cambridge Analytica scandal, in which clandestinely acquired Facebook user data was used for election campaigning, is usually thought of as an issue confined to US politics. But the company from which Cambridge Analytica was directed, the shadowy UK data analytics and political consulting firm Strategic Communication Laboratories, had already honed its skills in social media–driven election manipulation in Africa, Asia and Eastern Europe, for private and possibly state clients.[76]

More broadly, a variety of the developing world's social institutions are shaped by the CCC. As Kwet argues, South Africa's national e-education initiative is a vehicle by which Big Tech corporations 'capture' the nation's education, economy and society.[77] Starting with the apparently benign adoption of operating systems such as Microsoft Windows or Google Android, young people and teachers become locked into education-specific corporate products such as Office 365 Education or Google Workplace for Education. This step – contravening the South African government's overt commitment to the use of free and open-source software – effects a partial privatization of a nominally public education system through the learning systems designed by Silicon Valley. At an architecture level, 'software,

hardware and network connectivity' in turn open a path to curricula shaped by Western cultural biases.[78]

Asymmetrical cybernetic circulation is a question not only of domination, but also, inseparably, of disposability. Despite the global scale of the CCC's operations, its core profits generally come from high consumption zones: of Facebook's $116.8 billion revenue in 2022, nearly half – $54.5 billion – was generated in the United States and Canada, despite only 13 per cent of users living there, while another $25.7 billion was generated in Europe.[79] Other CCC corporations show similar revenue distributions: most revenue comes from users in the affluent regions of the world economy who constitute only a relatively small proportion of total network users. A consequence is that the CCC puts relatively proportionally less resources into its 'developing world' operations. There are, as we will see, controversies over the control of what could be considered harmful or dangerous messaging conducted on US and European platforms. These, however, pale in comparison to the complete neglect of moderation issues in social media's poorer markets. The most notorious example is that of Myanmar, where Facebook allowed expressions of hate against the Rohingya minority to circulate unchecked, contributing to an explosion of genocidal violence in 2017.

Another aspect of this disposability is that the CCC is most likely to source its cheap labour – such as Apple's subcontracting of electronics assembly work – in China. The same applies to the outsourcing of click-work content moderation and data-cleaning tasks, with their attendant exposure to psychological trauma. Ultimately, this logic permeates operations beyond the direct control of the CCC itself, and is crucial to its own supply chains, such as the mining of metals necessary for the production of digital devices, or the massive disposal of discarded phones and computers as e-waste shipped to Africa and Asia.

While the CCC consigns its dirty work and wastes to the poorer zones of the world market, it also often blocks the circulation of poor people moving to rich zones. Big Tech companies based in California go ‘body shopping’ for highly trained and talented programmers from Asia.[80] But they are also involved in the elaborate system of smart border controls and policing designed to stop unwanted migrants from entering the Global North. Google, Amazon and Microsoft have all been criticized for providing the US Immigration and Customs Enforcement agency with cloud computing and data mining that power the ‘deportation platforms’ used for tracing and arresting undocumented migrants.[81] The Cameroonian social theorist Achille Mbembe has written eloquently of the ‘necropolitical’ regime of computational control exercised over the life and death of people fleeing poverty, war and climate disasters by a system of border controls that relies on digital documents, social media scans, biometric readings, and even DNA analysis.[82]

In analysing digital colonialism, it is important to recognize its contradictions. Cybernetic circulation on a world scale enables extreme exploitation, but also (as Marx anticipated) organization against it. And while the asymmetries of digital power favour the Global North, it would be a mistake to reduce the story of digitization in the Global South to one of cybernetic subjugation. Latin American media scholars Jonas Valente and Rafael Grohmann have recently argued against reducing accounts of digital data flows in the region to the issue of ‘data colonialism’.[83] In the Global South, there is a vast variety of digital development, including the emergence of domestic cybercapitalists as predatory as their Northern counterparts, as well as new, liberatory experiments. Theorists such as Mejias and Couldry even suggest that the term ‘digital colonialism’ should be used to describe an extractive cybernetic logic inflicted on network users in the Global North and South alike. The idea that we are all digitally colonized clearly has its own universalizing pitfalls, but it is a useful

reminder that cybernetic circulation touches the world almost ubiquitously, but extremely unequally.

STAGNATION AND ACCELERATION

In the ongoing debate between techno-optimists and techno-pessimists, the issue of digital automation occupies a strange position. The idea that computerization will result in major increases in economic productivity and a reduction in the human workforce is widely accepted by both. For the optimists, this promises a world of prosperity and leisure; for the pessimists, it threatens a crisis of technological unemployment as humans are inexorably replaced by machines. But there is a third school of thought, represented by economists who cast doubt on both of these scenarios.[84] These sceptics draw on data showing that, over the years when digital technologies were widely introduced in the workplace, between 1980 and today, rates of economic growth and productivity increase have slowed rather than accelerated. On the basis of this ‘productivity paradox’, they conclude that computers and networks are in reality far less effective in improving workplace efficiency than utopians claim or pessimists dread, and that the predictions of both camps about digital automation are wildly exaggerated.[85]

Two of these sceptical theorists, Aaron Benanav and Jason Smith, have recently responded to what they see as overblown hopes and fears about Big Tech.[86] As they point out, the statistics on industrial performance, drawn mainly from the manufacturing sector, show almost none of the sharp increases in productivity that might be expected from an ongoing robot revolution. Benanav contends that the ‘automation discourse’ which takes job losses and precarity as evidence of runaway technological innovation is mistaken. In fact, he suggests that it manifests the very opposite – an economic slowdown, caused by global overproduction and

characterized by a general reluctance of businesses to invest in new technologies. In this perspective, Big Tech's famous 'disruptive' inventions amount to – in Smith's words – 'toys not tools'.[87]

In our view, this argument about stagnation does indeed provide the correct context for discussing the rise of the CCC. But it misinterprets its project, which is not centrally about production, but circulation. Tech companies are not, for the most part, robot manufacturers. Their circulatory innovations are effective precisely because they are camouflaged as 'toys' – bots, apps, 'likes'. The CCC is a response to the slowing economy, but it does not primarily aim at intensifying the extraction of surplus value at the point of production. Rather, it attempts to compensate for its decline by accelerating the velocity of capital's circulation, increasing the volume, precision and speed with which commodities travel through supply chains and the accuracy with which they are targeted to the various strata of an increasingly unequal and segmented society.[88] In this way, the CCC ultimately enables capital to speed its turnover time, multiplying the repetitions of the entire chain of profit generation in any given period of circulation.

This circulatory automation has not, so far, created the waves of technological unemployment that many have anticipated. While some jobs are being destroyed, many are also created. The Google–Facebook AdTech duopoly has, by grabbing legacy media advertising, gutted media newsrooms; but it has also, at whatever cost in quality, generated digital journalists – though these are now threatened in turn by text-generating large-language models. Amazon has shuttered malls and reduced retail employment through e-commerce; but through its warehouse and delivery services it has also established itself as the second-largest private employer in the United States – even if pickers apprehensively await its next-generation robotics. Whether the fate of workers in the cybernetic upheaval will resemble that of workers in previous industrial revolutions, forced by

mechanization into tumultuous and painful migration from one sector to another, or rather of the horse, which has been all but eliminated from capitalism's circuit, has yet to be determined.

What is clear, though, is that automation gives capital greater command over terms and conditions of employment, reducing workers to a disposable, insecure component with restricted autonomy, dwarfed by the scale and capacities of the fixed capital in which they function as subordinated 'links'. And this goes not only for workers: the entire burden of the CCC is increasingly to automate the consumer, in the sense of delegating the very articulation of needs and desires to algorithmic processes. Not only are life activities increasingly confined to the commodity form, but they are rendered ever more predictable, pre-empted and programmed. The so-called 'consumer' tends towards the status of a credit card against which an already anticipated series of digital charges will be made, running indefinitely into the future, possibly even beyond the expiry of the body with which it is associated. In this sense, the aim of the CCC and its relentless series of feedback loops is, in André Jansson's words, to 'captivate' and 'entangle' a subjectivity 'aligned with the premise of the system itself' – a subjectivity that becomes in effect a 'cybernetic switch'.[89]

None of this, however, should be taken as an assurance that the CCC's project will succeed. As we will show, attempts to accelerate the circulatory velocity of goods without limit, in response to decelerating production, generate their own refluxes, breaks and blockages. And if the CCC does succeed, nothing guarantees a good outcome, for capital or anyone else: the collision between capital's expanding circulation of commodities and the biospheric and metabolic boundaries necessary to sustain human societies is clearly becoming increasingly acute. We therefore turn now from the circulation of commodities to the circulation of social conflicts.

3

The Circulation of Antagonisms

In 1994, as internet use spread rapidly in North America and Europe, and more slowly and unevenly across the rest of the planet, armed Mayan peasants emerged from the jungles of Chiapas in Mexico and seized control of several provincial cities. Their movement, the Zapatistas, stood in opposition to the free-trade agreement between the United States, Canada and Mexico that was opening their lands to commercial exploitation by agribusiness and mining companies. It was their charismatic, masked spokesperson Subcomandante Marcos – a one-time radical student turned agrarian communist – who transmitted his eloquent, poetic communiqués across the internet, allegedly from a laptop plugged into the cigarette-lighter on an old truck. Observing how the news flashed from the message boards of anthropologists and experts in Mexican politics, and thence on to hacker collectives, social movements and trades unions, the Marxist scholar Harry Cleaver wrote of the formation of an ‘electronic fabric of struggle’.[1]

The struggles that Cleaver saw coming together across the internet were those of what became the anti- or alter-globalist movement. Capitalism, having won the Cold War, was now globalizing. Manufacturing industries were transferring their operations from the Global North to the South, to run in factories with lower wages and less regulation; governments relinquished economic controls to free-trade treaties; and around the world, public assets were being sold off to private interests. An unstable alliance of trade unions with welfare rights and environmental activists from the Global North and communities in the Global South emerged, fighting corporate bids to grab

land, water and other resources, and secure cheap labour from the sweatshops of special export zones. These movements called for a different internationalism with the hopeful slogan ‘Another World is Possible’. Alter-globalism movements were broad and varied in their class composition. While they were generally anti-corporate in their viewpoint and opposed to the excesses of giant multinational firms, they were by no means necessarily Marxist in perspective. Rather, they were unstable alliances between labour, liberal, libertarian, ecological, feminist and anticolonial activism.

Cleaver’s formulation about a potential ‘electronic fabric of struggle’ came from a specific theoretical background, that of autonomist Marxism – so called because of the emphasis it placed on the self-organizing power of the working class. Originating in the Italian factories of the 1960s and ’70s, autonomist Marxism, also sometimes known as *operaismo* (‘workerism’) initially propounded a conventional idea of the working class as industrial workers. However, over time, and with the intervention of a substantial feminist contingent, autonomists began to think more in terms of a ‘social factory’ composed of locations and institutions throughout the circuit of capital, including shops, schools and households.

Autonomist theorists had already suggested the idea of a ‘circulation of struggles’ that would oppose a world based on the circulation of commodities.[2] They initially thought of this primarily in terms of how industrial strikes communicated with and inspired each other, creating ‘strike waves’; but they soon began to consider how this process might work across the entire social factory – that is to say, throughout the entire circuit of capital, including not only the workplace, but also in moments of market exchange, in conflicts over the price of goods and the cost of living, and in sites of social reproduction such as homes, hospitals, schools and universities. Not only might there be worker strikes, occupations and sabotage at the point of production, but the sale of commodities could be

interrupted by protests and actions against unfair prices (for example, rent strikes). Moreover, capital's purchase of raw materials might be frustrated by resource conflicts in mines, and the recruitment of its labour force might be challenged by feminist struggles against unwaged labour in the home. If each node in the circuit of capital became a point of potential rebellion, then the circulation of struggles would become a methodology for revolution in the social factory.

Digital networks lent themselves to the idea of the circulation of struggle. Cleaver's discussion of the 'electronic fabric' of resistance reflected what was already happening. Alter-globalism sprung up alongside the dot-com boom and shared the digital optimism of Silicon Valley even as it opposed its commodification of digital sociality. Its ranks included dissident hackers, students and young people familiar with personal computers, painfully slow modem connections, music piracy and videogames. 'Alternative media' networks were integral to the alter-globalist worldview. Listservs, mailing lists, blogs, bulletin boards and portals for various aspects of left politics became ingredients of decentralized, rhizomatic, 'cyber-left' politics.[3]

The Battle of Seattle, a three-day-long confrontation between police and protesters, disrupted a meeting of the World Trade Organization. At that event the 'alternative media centre' was composed of banks of computers uploading videos of the confrontation and reporting on the varied causes that brought a multitudinous array of people – steelworker trade unionists, Greenpeace members, land defenders – to the protest. Networks were similarly central to the organization of World Social Forums (an intentional contrast to the World Economic Forum for corporate jet-setters at Davos, Switzerland) held in Porto Alegre, Brazil, and then in Mumbai, India, and Nairobi, Kenya, where alter-globalist activists congregated to discuss strategy. For several years, alter-globalism travelled a path of intensifying confrontations with the state, in which more demonstrations disrupted

meetings of capital's economic planners and trade negotiators in Montreal, Gothenburg and Genoa. In all cases, the media centres became a target of police determined to shut down the movements' digital eyes and ears.

Other autonomists developed Cleaver's idea of an 'electronic fabric of struggle'. One of the authors of this book theorized a 'cyber-Marxism' pushing heavily to advance the prospects for digital subversion. And while the tear gas from the Battle of Seattle still hung in the air, Michael Hardt and Antonio Negri (a veteran of autonomist politics) published their widely read and highly controversial *Empire*, arguing that the traditional Marxist working class had transformed into 'the multitude' – a new, variegated collective subject, unified by an 'immaterial labour' whose paradigmatic forms were to be found on digital networks, a collective protagonist situated in but also potentially against the 'Empire' of globalized capital.

These conceptual innovations infuriated many orthodox Marxists. Even many of Hardt and Negri's fellow autonomists were sceptical towards the suggestion that a vaguely defined 'immaterial labour', whose exemplary case seemed to be computer programming, was now the bonding force of a new revolutionary subject. Nonetheless, *Empire* was a bellwether text that placed issues of the network form at the centre of radical debate.

COMPLEX CLASS CONFLICT

This is a good moment to explain what we mean by class conflict. Readers who do not want to engage with a theoretical discussion may skip forward and resume the story of online struggles in the next section, but we think it is worthwhile to set out the premises from which we approach networked tumults.

Marx saw capitalist society divided by the relations governing resources and technologies. Capitalists own and control the means of production; the proletariat or working class labour for capitalists, or grapple with the misery

of unemployment.[4] The split between those who live from profit and those who live from work was, Marx held, the division that prevented capitalism from functioning as a harmonious human community. He thought this polarization would become sharper and clearer over time. On this basis, Marx and Engels issued their famous call for ‘workers of the world’ to unite in a struggle against capital with ‘nothing to lose but their chains’, confident that capitalism’s own factory organization and growing powers of communication would assist in this task.[5]

But the class relation has become more complex since Marx’s time. Even in his writings there is acknowledgement of an intermediate category – a middle-class ambiguously situated between capital and workers.[6] As the capitalist system has expanded, this group has grown, and can itself now be divided into sub-groups: a professional and managerial class paid to train and discipline other workers, and the so-called self-employed small businesspeople who work for themselves. The latter have been described as having ‘contradictory class locations’, their loyalties divided between labour and capital.[7]

At the same time, capital and labour have mutated. Most of Marx’s writing on class focused on industrial production, capital being represented by the owners of factories, mines and mills, labour by legions of manual workers. Successive generations of technological innovation – from increasing use of the steam-powered machinery Marx observed, then electrically powered assembly lines, and now robots, biotechnologies and electronic networks – have altered the composition of both capital and its proletariat.

These changes in composition extend beyond the point of production. Our diagram of the circuit of capital showed connected moments of production, circulation and social reproduction. Capital’s expansion outwards from the factory to the ‘social factory’ means that there are now vast sectors of for-profit business focused on the spheres of circulation and

social reproduction.[8] These have their own distinct contingents of labour: today's proletarian may be an autoworker (production), a social media moderator (circulation), or a personal care worker (social reproduction).

This variegation of labour has been intensified by the globalizing scope of contemporary capitalism. Global supply chains connect operations between locales with extreme differentiation in wages and working conditions. Later in this chapter we examine how globalization has altered class relations in the tech industry, by expanding its reliance on low-wage labour in Latin America, Asia and Africa.

At a high level of abstraction, class relations can be separated from race and gender, but in practice they are intertwined. Historically, capitalism emerged in the colonizing nations of Europe, and its enterprises were for centuries primarily owned and managed by white men. Racism and sexism separated well-paid work from poorly paid work, worklessness or unwaged labour.

But these configurations are now being rapidly changed by the rise of China, India and other regions of the Global South as economic superpowers, and by the ongoing struggles of women for social and economic equality. These transformations are so fast that sometimes it is in capital's interest to dissolve or ameliorate discrimination to enlarge the pool of talent from which it can recruit, or to avoid conflict – factors that today produce the phenomenon of so-called 'woke capitalism'. Issues of class are always-already part of a shifting 'intersectional' matrix of power and wealth.[9]

Marx's and Engels's call to unite 'workers of the world' clearly underestimated the task at hand. With the expansion of the middle strata and the entanglement of class with gender and race, as well as the dynamic growth of capital as a global system, class relations have become crisscrossed by internal divisions, nested subhierarchies and ambivalent interests. As social theorists Michael McCarthy and Mathieu Hikaru Desan

observe, the complexity of class structures and the importance of non-class factors can be seen as flaws in the original conceptualization of class, but also as problems that have become increasingly apparent with the development of capital.[10]

The autonomists we have been citing spoke of a working class ‘in and against capital’, emphasizing the recurrence of class conflict. However, as other schools of Marxism have argued, this perspective is one-sided. The working class is not just ‘in and against’ capitalism, it is ‘in, against and *of* capitalism’. In other words, while workers are exploited by capital, they are themselves still part of the system; in bargaining, or even striking over wages and working conditions, they are (usually) acting as commodity owners with just one commodity to sell: their labour power.[11]

Most of the time, the daily business of surviving and getting by within an established capitalist system – the sheer ‘mute compulsion’ of economic necessity – restrains class conflict.[12] And when workers do struggle, it may be against not only bosses, but also other workers, in ‘negative solidarity’.[13] We are thinking here particularly of the success – historical and also very current – of fascist and right populist movements in recruiting sections of the working class to support racist, xenophobic, misogynistic and homophobic principles, that, while supposedly marshalled against liberal elites, ultimately celebrate and empower capital.

Fred Moten and Stefano Harney have written eloquently of a ‘general antagonism’ engendered by capitalism’s competitive and exploitative social relations. However, our use of the term ‘antagonism’ both acknowledges and departs from theirs. For us, ‘antagonism’ is not an inherently anti-capitalist sentiment, but unfortunately also encompasses the hostilities capital engenders within its working classes, between class fractions, and along fracture lines defined by gender and race.[14]

However, the binary division between a class of capitalists and the society that it dominates has not been abolished. As the world has

digitalized over the last forty years, inequalities have only sharpened. Today, the top 10 per cent of adults own nearly all of the world's wealth, while half are entirely excluded: the world's richest 1 per cent own 43 per cent of all global financial assets. Since 2020, 5 billion people have become poorer, while the world's five richest men have together more than doubled their fortunes – at a rate of $14 million per hour. By some estimates, eight of the world's ten richest people (and all ten are men) are or have been heads of tech-affiliated companies.[15]

This concentration of wealth creates the conditions of relative scarcity in which the 'workers of the world' – waged and unwaged – compete and fight among themselves for scraps amid the proliferating and compounding hostilities of a general antagonism. The extremity of capital's class polarization ramifies downwards, generating a society saturated by contradictory and multidirectional social conflicts, all of which now arm themselves with digital weapons, available courtesy of (and often wielded by) the capitalists of the CCC. It is this multiplication of networked hostilities that we refer to as a 'circulation of antagonisms'. In identifying capitalism's cybernetic circulatory complex, we are necessarily confronting class conflicts that are likewise circulatory, complex and cybernetic.

FACEBOOK REVOLUTIONS?

No one knows how the alter-globalization movement might have developed if, on 11 September 2001, the Twin Towers of the New York Trade Centre had not exploded in fire and smoke, destroyed by militant Islamic fundamentalists. The shock of 9/11 took the wind out of alter-globalism's sails; amid the US invasions of Afghanistan and Iraq, it suddenly seemed unlikely that 'Another World' was indeed possible. Although there were a few further big alter-globalization demonstrations, such as those in Scotland in 2005 and Germany in 2007, the movement soon petered out. The war on

terror would have major implications for the internet, particularly through the enormous intensification of surveillance by the US National Security Agency; but it would be years before this was fully revealed. In the meantime, very little was heard about the ‘circulation of struggles’.

The ebbing of alter-globalization coincided with the 2000 crash in Silicon Valley; ‘dotcoms’ and ‘dotcommunists’ retreated simultaneously.[16] When digital capitalism began to reorganize itself, it was as the CCC, with the commodified Web 2.0 of Google and Facebook, fuelled by user data and social media engagement. The CCC, building on the commercial lessons learned from the dot-com failure, was driven by expanded global internet interconnection, causing the blunt separation between the digital haves and have-nots to give way to more profitable gradations between digital haves and have-lesses.[17]

But the CCC also incorporated network practices – interactive, conversational websites, early video uploads, open-source software – that alt-globalist activists had pioneered. In a sharp critique of cyberleftism, media theorist Jodi Dean observed that this was a new ‘communicational capital’ seemingly able to appropriate anything radicals might come up with, co-opting and absorbing what only a few years earlier had been the digital techniques of radical activism.[18]

The next wave of digitally mediated social struggles came after the financial crash of 2008. The flatlining of important financial and industrial sectors gave the CCC the opportunity to assume a leading role in the world market. But the crash also ignited unrest and uprisings. Unemployment rates, especially among young people, shot up around the world. Government austerity programmes, initiated to pay for the bailout of banks and big capitalist enterprises, began to bite. Masses of working, or now workless, people and students protested poverty and precarity. These protests took various forms, but the most characteristic was the take-the-square occupation, in which people seized some central urban location,

made it a forum for popular assemblies voicing their discontent, and refused to leave.

The first major example of this trend was the so-called Arab Spring, which started in Tunisia at the close of 2010 and spread to Egypt in January 2011. Protesters occupying Cairo's Tahrir Square fought off police and goon squads, forcing the resignation of the authoritarian Mubarak government. Similar uprisings broke out across the Arab World, and soon erupted across the Mediterranean, in Athens and Madrid. The phenomenon then crossed the Atlantic, as the Occupy Wall Street movement filled Zuccotti Park in New York and locations in scores of North American cities. By 2014 take-the-square had travelled to Rio, Istanbul and Kyiv.

Social media featured widely in these occupations. As Paolo Gerbuado notes, Occupy protests acquired an almost standardized 'digital choreography': the call to mobilize would begin online; protesters would then meet in the streets; documentation of the occupation would circulate via Facebook and other platforms; and all the while, protesters would coordinate the daily operations of the commune (food distribution, security, washrooms) through mobile phones and social networks.[19] The use of social media also helped build wider support, as participants' online engagement often fed into mainstream media coverage.

Journalists soon started to refer to Occupy movements as Facebook – or Twitter, or YouTube – revolutions. The digital virality of revolts was heavily emphasized in coverage such as *Time*'s 2011 issue anointing a bandana-masked protestor as 'person of the year'. Such reporting in many ways replicated the CCC's promotion of its digital products. The CCC's social media platforms revelled in their alignment with the pro-democracy movements of the Arab Spring, and 'basked in the reflected glory of press coverage that centred their part in the protests: often to the exclusion of those who were actually on the streets'.[20] It is even possible that some

senior Google staffers played a part in designing digital sites important in the Egyptian uprising, though the extent of this involvement is opaque.[21]

The media's focus on digital agitation obscured the basic causes of unrest – unemployment, immiseration and insecurity – and sometimes created the absurd impression that no social rebellions had ever been possible prior to the invention of the smartphone. Nonetheless, the 2011 unrest did erupt among populations for whom networks were increasingly commonplace, demonstrating on a much larger scale than the alt-globalization protests of a decade before the impact of digital circulation in social struggles.

There was only one problem. The so-called Facebook Revolutions did not succeed. Most of these movements fizzled out or were repressed. Occupiers often demanded 'the fall of the regime'; but in the few cases in which the uprisings did force a change of government, as in Egypt and Ukraine, secular and left protesters were soon eclipsed by fundamentalist and nationalist forces. In Libya and Syria, the Arab Spring spiralled into civil war and foreign intervention. Only in Tunisia did the uprising for a while appear to set in motion a radical democratization of society. In the United States and Europe, Brazil and Turkey, and other places that had appeared to be in the midst of major upheavals, the transformative momentum of networked revolt seemed to have passed. Within a few months the squares were empty, the slogans sand-blasted off the walls.

Zeynep Tufekci, who witnessed the rise and fall of a major occupation in Istanbul's Gezi Park, formulated an important critique of 'the power and fragility of networked protest'.[22] The internet, she wrote, offers social rebellions a scope and speed of communication that enables rapid mobilization but short-circuits the task of constructing politically coherent and organizationally cohesive groupings. The take-the-square occupations came together very quickly and as highly variegated movements, whose participants ranged across the spectrum from anarchists, communists and

socialists to liberals and centrists of all stripes, and even some libertarian or nationalist right wingers. Neither ad hoc social media conversation nor ultra-horizontalist meetings worked well to resolve the problems of such unwieldly coalitions.

The apparent strength of these movements became a weakness, as fast but fragile revolts faded or shattered once state forces recovered from their initial surprise. And as police and other security forces themselves rapidly became more familiar with network technologies, the massive surveillance potential of social media – created for commercial purposes, but now scanned by the state – began to be used to arrest and convict radical protesters. ‘Wide in scope, weak in ties; fast but evanescent; unstoppably viral but ubiquitously surveilled’, the digital circulation of struggles offered activists looking beyond capital new tactical possibilities, but also posed difficult questions about the durability and depth of digital organizing.[23]

During the Occupy era, some activists considered the problems of using CCC platforms, and experimented with the construction and use of non-commercial activist networks such as Diaspora, Crabgrass and Lorea.[24] But many protesters regarded social media as a benign gift, an extension of the ‘alternative media’ they were familiar with. As the promise of the take-the-square movements began to fade, increasing attention was given to the political costs and problems of networks that simultaneously circulated struggles and commodities.

In this reassessment of digital conditions, feminist analysis provided a crucial ingredient. Donna Haraway’s famous socialist-feminist ‘Cyborg Manifesto’ of 1985 played a remarkable role in asserting the positive possibilities of digital technologies previously regarded as incorrigibly masculine. This essay was a forerunner of a surge in cyberfeminist online activism in the 1990s, typified by cybercollectives such as VNS Matrix, subRosa and the Old Boys Network. These groups in turn influenced later

techno-positive currents of gender politics, such as the Xenofeminism of the Laboria Cuboniks collective.[25]

In this respect, Haraway's manifesto performed a provocative role analogous to what Hardt and Negri achieved in relation to Marxism with their suggestion that networks could be recaptured from capital. Indeed, Hardt and Negri cited Haraway, and the all three of them were, and continue to be, criticized from cyborg-averse, techno-skeptical Marxist-feminist positions.[26]

In the aftermath of Occupy, however, more complex lines of feminist cybertheory found a path through this polarized confrontation to consider the place of women in the domain of the CCC. While Haraway's cyborg discussion of 1985 addressed the cybernetic element of the CCC, it was issued well before the circulatory role of computing had fully emerged. Similarly, Terranova's prescient observations about free labour in networks, made in 2000, preceded the full development of what would become known as social media. Now feminist and Marxist-feminist critics looked into this new phase and considered what 'the forms of affective and immaterial labour … exploited in the economic circuits of the commercial web' meant for reproductive labour, in and out of the home.[27]

Facebook, which had become the most widely used social media platform in the world in 2009, was a particular object of feminist scrutiny for the way it was altering interpersonal and emotional relations. Laurel Ptak's 2014 art installation, 'Wages for Facebook', criticized the full implications of the free labour thesis in regard to the social media giant: 'They say it's friendship, we say it is unwaged work. With every like, chat, tag or poke our subjectivity turns them a profit.'[28] In a more nuanced approach, Kylie Jarrett unpacked the development of the 'digital housewife' – a much less alluring figure than the feminist cyborg – revealing the 'contradictory dynamics of exploitation and agency associated with digital

media capitalism' and the interplay of affect and commodification in Facebook's 'assembly line' of social relations.[29]

The shifting tenor of network politics was exemplified in a striking manner in the work of Elise Thorburn during the Quebec Student Strike of 2012. Observing the activist practice of live-streaming video from the streets, she analysed its potential to 'open up nodes of counter-power, disrupting state surveillance, surveilling the police themselves, and providing the space for the construction of subjectivity on the part of political actors in the streets'.[30]

In 2016, however, Thorburn's work took a different track, arguing that capital's 'increasingly virtualized' regime was producing 'psychic and corporeal impacts' that amounted to 'a crisis in social reproduction'. With life 'increasingly monitored, collected, aggregated, parsed, and archived for later use, potentially for manipulative purposes, value extraction, and control', social media platforms now imposed a continual present antithetical to a political perspective. While Thorburn continued to affirm the possibilities of networked counter-power, the shoe was now clearly on the other foot. This was a 'speed up' in the social factory, in which digital networks played an essential part in capital's 'machinic decomposition of the proletariat'.[31] This remark would prove all too prophetic.

ROTATING RIGHT

Narrative accounts of the 'firebrand waves of digital activism' generally assume their emergence from the left, or at least liberal, end of the political spectrum.[32] Yet after Occupy, digital mobilization shifted to the right. The far right has long had a presence on the internet, but the emergence of dynamic, systematic and large-scale cyberfascist campaigns is a new phenomenon. It is also one that discomforts and subverts the left's concept of a circulation of struggles, implicit in which is the assumption that these

are progressive, emancipatory struggles. But fascists also struggle against progressives, whose tactics and themes they often co-opt, leading to the strange 'doppelganger' effects that Naomi Klein has described, whereby fascist cyberagitation offers a mirror image of the causes it opposes.[33]

If Zapatista insurrection was the eureka moment for left digital activism, an equivalent for the right is the fury against Chinese 'gold farmers' that swept the online game *World of Warcraft* in the mid 2000s.[34] This wave of racially inflected rage against allegedly Chinese players who 'mined' the game's digital assets for conversion into real cash was the moment when, according his own account, Steve Bannon – later a Trump strategist – first witnessed the 'monster power' of 'intense young men' online.[35] Digital gameplay continued to serve as a laboratory for reactionary networking in the Gamergate scandal of 2014–15, as internet trolls harassed feminist game developers for destroying traditional gaming values, cheered on by the tweets of Bannon protégé and future alt-right celebrity Milo Yiannopoulos.[36]

By this time, Bannon was executive director of the website *Breitbart News*, which he had co-founded as 'the platform for the alt-right'.[37] But *Breitbart* was just one among a range of similar sites, such as the *Daily Caller*, *Gateway Pundit*, *Washington Examiner*, *Infowars*, Conservative Treehouse and Truthfeed – all of which had strong links to Fox News.[38] Supplying content that was then copied by a larger array of small alt-right sites, these hubs formed what media scholar Jonathan Albright describes as a 'micro-propaganda machine surrounding the mainstream media system'.[39]

Further light is cast on the formation of these right-wing networks by Jen Schradie, a radical documentary filmmaker turned academic, who in 2013 investigated the use of digital messaging in political battles over unionization, civil rights and abortion in North Carolina. She found that racialized and working-class communities, which might typically align with progressive causes, not only faced barriers in terms of internet access,

digital literacy and reliable connectivity, but lacked the time and resources to engage in digital production. Fears of repercussions also inhibited them from speaking out online. In contrast, conservative movements, with wealthier and more privileged participants, were better equipped to engage in sophisticated digital campaigns with professional strategists and targeted advertising. This was particularly important for optimizing the algorithmic amplification of networked messages and prefabricated memes.[40]

Moreover, because conservative networkers were comfortable working with hierarchical, top-down structures, their messaging was more consistent in its content than that emanating from the horizontalist left. With teams of 'savvy social media staff … conservatives dominate in the digital domain thanks to a focused message of freedom rather than a fractured one of fairness'.[41] Criticizing the 'revolutionary giddiness' of left internet politics, Schradie concluded that 'the prototypical digital activist was more likely to be a Tea Party member or a conservative think-tank staffer than a left-wing student or worker activist'.[42] She further suggested that the collapse of serious journalism, resulting from Google and Facebook's syphoning off of media advertising revenues, had left a gaping hole in the public sphere that was rapidly being filled by an influx of networked right-wing propaganda.

These processes exploded into view with the 2016 election of Donald Trump to the US presidency. There were several digital factors in play. One was Trump's own Twitter account, which he had started in 2009 as a media celebrity; he wrote some 8,000 tweets in 2016, bypassing established media to communicate directly with his followers.[43] Another was an entirely legitimate, and very expensive, Facebook advertising campaign. A third strand was the Cambridge Analytica scandal, in which Steve Bannon and right-wing billionaire data scientist Robert Mercer surreptitiously acquired Facebook profiles of tens of millions of US voters, which they then used to target political ads.[44] A fourth was the purely profit-driven generation of pro-Trump content by website owners in Macedonia, who knew a good

scam when they saw one. A fifth was the anti-Clinton, pro-Trump hacking, and mis- and dis-information activities of Russian intelligence agencies. Alongside this was a sixth factor, the generalized pro-Trump tenor of a digital ecosystem variously referred to as ‘alt-right’, or even ‘cyber-fascist’.[45]

This last category highlights the problem of defining the sources of Trump’s digital mobilization, which was broad but internally differentiated. Some analysts distinguish between its right-populist component, the alt-right, and fascism itself. In this view, the right-populist tendency reflects an electoral, party-based nationalism calling for stronger borders and immigration control, indicting liberal elites, and asserting so-called traditional cultural values. The alt-right is primarily a network phenomenon, linking a loose ensemble of white supremacists, men’s rights groups and meme provocateurs contemptuous of mainstream conservatism, and engaged in the crowd-sourced trolling and doxing of designated enemies. The term ‘fascism’ is then restricted to movements identifying with the legacy of Hitler, Mussolini and Franco, and nursing plans for the seizure of authoritarian state power, violent elimination of opponents, and various forms of ethnic cleansing of the body politic.

However, such tidy categorizations fail to take account of the many gateways and overlaps between the three groups: it is precisely this porosity that creates the new configurations of what Alberto Toscano terms ‘late fascism’.[46] This process was nowhere more apparent than in the digital realm, where, for example, supposedly ‘ironic’ uses of Nazi insignia and terminology by 4Chan trolls bled into their fundamentally unironic deployment by serious fascists giving *Sieg Heil* salutes with a touch of ‘jokiness’, and violent right-wing gangs such as the Oath Keepers and Proud Boys bearing signs with ostensibly ‘comedic’ images, such as that of Pepe the Frog.[47]

What became clear within the first year of Trump's presidency was the close correspondence between 'late fascist' messaging and algorithmic marketing. As the journalist Andrew Marantz explains in his history of the alt-right's digital campaigns, keeping users 'engaged' – that is, online and exposed to revenue-generating advertisements – relies on activating content, especially adrenalin-boosting provocations: 'what enrages engages'. The algorithmic targeting of inflammatory content and gratifying news then produces effects that deepen segregation and escalate hostility; recommendations lead from neutral to extreme content, creating 'filter bubbles' dominated by confirmation bias. The specific genius of the CCC has been to automate this propagation through the use of bots. Once set in motion, these viral contagions are difficult for CCC giants to squash: difficult technically because of the expense and complexity of content moderation processes; but also difficult economically, because revenues depend on attention-attracting flamethrowers.

THE SOCIAL DILEMMA

In August 2017, a Unite the Right rally, largely organized through social media, brought together white supremacists, neo-Nazis, and other far-right extremists in Charlottesville, Virginia. Clashes with counter-protesters resulted in the murder of Heather Heyer and the injury of many other counter-protesters. At a press conference, President Trump said there were 'very fine people on both sides' of the conflict. In the aftermath of these events, some CCC companies took steps to remove hate speech and extreme right-wing propaganda from their platforms.

Several individuals and organizations associated with the rally were deplatformed – that is, permanently or temporarily banned – from various online services. In 2018, Alex Jones and his platform, *Infowars*, were suspended from YouTube, Apple, Facebook and Spotify, citing violations

related to hate speech. Facebook and Twitter acted against other far-right accounts. The *Daily Stormer*, a neo-Nazi website, was dropped by its domain registrar GoDaddy, and later Cloudflare, a company that provides online protection services, also terminated its relationship with the website. PayPal, Apple Pay and other payment services began to restrict and shut down accounts connected to far-right groups and individuals. Reddit shut down several subreddits associated with white supremacy and neo-Nazi content.

Acknowledging that social media had harboured what was often loosely described as ‘extremist’ content, some CCC owners, managers and staff produced a media-friendly mea culpa. In 2020, the film *The Social Dilemma* dropped on Netflix. Billed as a ‘docudrama’, it featured a troop of CCC personalities and critics, led by former Google ‘design ethicist’ Tristan Harris, lamenting the calamitous effects of social media. Its fictional drama depicts the destruction of a suburban American family by the compulsive powers of smartphone use, which drives them from silent, screen-absorbed dinners into a spiral of disputes, anomie and angst.

The film mounts a melodramatic, yet sometimes poignant indictment of high-intensity cybernetic marketing and its process of what Harris terms ‘human downgrading’ in a system of mutually reinforcing harms – addiction, distraction, isolation, polarization and fake news, all of which weaken autonomy in a bid to capture advertising revenue.[48] The film is largely concerned with a nebulously described process of political polarization, and appears to distribute blame for ‘filter bubbles’ and ‘echo chambers’ equally on the extreme right and left, both of which are locked into patterns of symmetrical aggravation.

The Social Dilemma’s self-imposed limits are, however, startling. Having portrayed social media as agents of social decline, it concludes by rapidly and reassuringly affirming the need for and inevitability of profit-driven technological development, while gesturing vaguely towards

‘regulation’ through which the corporate giants might ‘take responsibility’ for their innovations. Calls for ethical design are replaced by exhortations for self-defensive consumer behaviour (limiting of screen time, blocking of notifications, spending time outside, and so on). The recuperative, depoliticized boundaries of techno-capitalism’s self-criticism thus snap smoothly into place.

CYBERFASCISM

The filter-bubble effects produced by advertising-fuelled cybernetic feedback loops have undoubtedly aided the rise of the right in the United States, and around the world.[49] But they offer only a partial explanation of the role of the CCC in this process. For a more complete analysis, we need to examine not just the circulatory loops of digital feeds, but also the larger global circulations of capital.

The polarizing processes of advertising-oriented digital design are virulent because they are superimposed on and entwined with transformations of the US (and global) economy since the 1970s, particularly in relation to the disintegration of working-class solidarity and public cohesion. These changes chiefly reflect the deindustrialization of the Global North, the replacement of manufacturing jobs with low-wage and often insecure service work, the financialization of everyday life, the erosion of public services, and the exacerbation of social inequalities. All of these factors intensify conflicts not only between labour and capital, but also within and between different strata of labour (permanent, precarious, waged, unwaged) and between workers and professional-managerial classes. Such divisions are then further mediated and intensified by issues around gender, sexuality and race – concerns intentionally amplified by the populist right’s culture wars.

The CCC is by no means solely responsible for these socially shattering economic transformations. However, as a leading force in the circulatory, globalizing, marketing and financial sector that replaced manufacturing at the core of the US economy, it is deeply implicated in them. Silicon Valley made its own contribution to deindustrialization in the 1980s, when it began sending electronic assembly work and microchip manufacturing to Asia, thereby ensuring its domestic operations contained no industrial counterweight to the ongoing devastation in the rustbelt of Detroit and a hundred other cities.

When the CCC emerged in its full-blown form, it did so on the basis of anti-union workplaces, such as the Amazon warehouses. The CCC inaugurated the gig economy gulf between low-wage food deliverers, ride-hail drivers and online microworkers, on the one hand, and well-paid software engineers, systems analysts and AI programmers on the other. At the apex of the system, so-called market 'rebels' such as Bill Gates, Steve Jobs, Sergey Brin, Larry Page, Mark Zuckerberg, Jeff Bezos and Elon Musk became exemplary representatives of a billionaire class that has not only multiplied the wealth differential between owners and workers but is also characterized by a hostility to unions, corporate taxation and public regulation.

Self-employment, made more accessible by CCC platforms, has been crucial to the rise of the right. Writing on 'cyber-fascism', Maurizio Lazzarato describes it as a movement supporting 'the market, business, individual initiative', and repudiating any government restrictions on personal liberties, all while calling on the strong state to repress 'minorities, the foreigners, the delinquents'.[50] It appeals to '[m]illions of non-owners and petty proprietors who see the *real* possibility of losing the little they have due to the "follies" of the stock market [and] find their material and spiritual "property" in the *phantasmal* affirmation of … the identity of the supreme people'.[51]

Lazzarato is here invoking Trotsky's classic analysis of the fascisms of the 1930s as the politics of the 'petit bourgeoisie' – the stratum of small or self-employed businesspeople.[52] In Trotsky's view, this class fraction had a fluid and ambiguous politics. It resented and feared the big capitalists who could so easily out-compete and buy them up, but sharply differentiated itself from the working class or proletariat by virtue of its members' status as owners. The petit bourgeoisie would, Trotsky wrote, be the most vocal and violent in supporting authoritarian strong men who promised to restore prosperity by cracking down on undeserving sectors of the population.

While hardly anyone today uses the term 'petit bourgeoisie', the reincarnation of the concept can be seen in the many forms of self-employed entrepreneurialism fostered by the digital economy, from so-called independent contractors employed by platforms like Uber, to social media influencers, freelance content providers and micro-publishers. The United States has always had a significant self-employed sector, but the networked economy has reshaped and reinforced such activity – not necessarily as a primary source of income, but often as a side hustle supplementing other low-wage or insecure work.

In investigative accounts of the contemporary US far right, the figure of the small-scale social media operator reappears persistently. Independent web entrepreneurs run sites with volatile and sensationalist pro-Trump content, building traffic to support equally inflammatory advertisements, merchandising purported health foods and survivalist gear, and speculating in cryptocurrencies. Such 'ideological entrepreneurship' is consistent with a vehement political attachment to 'free enterprise'.[53]

As American journalist Luke Mogelson remarks, 'because so many right-wing personalities go to such lengths to convert their activism into cash, it can be tempting to dismiss the ideas that they espouse as mere grift. Often, though, grifting is fundamental to the ideas that they espouse.'[54] Alex Jones and his *Infowars* site provide an example of the successful

translation of this model from small to very big business.[55] Or at least it did, prior to the 2022 judgement awarding a total of $1.4 billion in damages to the parents of victims of the Sandy Hook mass shooting, following Jones's claims that they were a deep-state hoax.

Ironically, right-wing digital entrepreneurship is often hostile to the liberal Big Tech billionaires whose platforms enable its activity. This animosity arises precisely because such self-employed ventures are dependent on the platform owners, vulnerable to whatever algorithmic alterations, speech regulation, content moderation or deplatforming the CCC may adopt to protect advertising revenues or fend off government intervention.

However, such small-business antagonism towards Big Tech owners is perfectly compatible with an idolatrous attachment to 'outsider' billionaires such as Trump, a charismatic techno-authoritarian worshipped as a supposed scourge of oppressive digital oligarchs. Such sentiment may also prove to be easily aligned with supposedly maverick tech-sector business figures, such as Musk, or with venture capitalist ideologues peddling dreams of privatized zones and enclaves ruled only by crypto-currency transactions, free of all regulatory intervention.[56]

This is not to say that digital self-employment and independent entrepreneurialism are inevitably reactionary. Trotsky's historical analysis of petit-bourgeois politics saw it as fickle; its fascist trajectory might take a different direction where there were strong anti-capitalist movements. More recent Marxist theorists discern progressive potential among self-employed freelancers.[57] Today, if only because of the accelerating collapse of waged journalism and the deteriorating conditions of academic labour, there are more and more instances of ideological entrepreneurship from the left.

Nonetheless, our point here is that, in neoliberal capitalism, digital networks have contributed to the rise of cyberfascism not only by offering new means of virtual propaganda and organization, but also, and more

materially, by reconfiguring class composition. The CCC's ultra-commodification of the internet has thus produced a new raft of intermediate, digitally self-employed positions that may favour an aggressive self-identification with capital and hostility to trade unions, public-sector employees and – above all – impoverished proletarians.

The attempt to limit the scope of digital capital's responsibility for social disintegration to issues of virtual architecture that might be solved by 'ethical design' or regulatory limitation obscures this implication. It fails to acknowledge that the CCC is a component in a profit-maximizing capitalism whose logic dictates that it decomposes its global working class into disposable, atomized, internecine competitive fractions – kindling to be ignited by the antisocial media of cyber-fascism. It is in the context of this turbulence that the polarizing and radicalizing effects of the CCC's antisocial media take hold, as both a virtual and material force decomposing working-class and middle-class opposition to capital.

STRUGGLES IN CIRCULATION

The relaying of social turbulence through cybernetic systems has not been limited to North America. On the contrary, it has been planetary. Though global capital survived the financial crash of 2008, economic recovery from the crisis was extraordinarily slow, punctuated by new crises, and marked by sharpening wealth inequalities within national economies. Between 2018 and 2021 social unrest surged, peaking at a level not seen since the 1960s.[58] The global revolt against neoliberalism swelled in Hong Kong, Paris, Barcelona, Santiago, Beirut, Tehran, Baghdad, Minneapolis, Delhi, Bogotá, São Paulo, Lagos and other cities around the world.[59] As people took to the streets to protest economic insecurity, social inequality and political corruption, protests swamped not just city squares but entire metropolitan

centres, and blockaded highways, docks, railways and airports in confrontations with police that rapidly grew into riots.

Observing these rebellions, Joshua Clover proposes a new frame of analysis that at once resembled and significantly departed from the 'circulation of struggles' analysis of the autonomists. He argues that, at certain moments in the history of capitalism – specifically during its pre-industrial mercantile phase, and then again in the era of the post-industrial world market – production is subsumed by processes of circulation, through which commodities are marketed and exchanged for profit.[60] Consequently, the locus of struggle moves from the factory-stopping strike to the city-stopping riot.

Capital's points of vulnerability, Clover argues, are not so much in the workplace, where commodities are produced, but rather in the transportation and logistical channels that bring them to the market. What ensues is not a circulation of struggles, but rather 'circulation struggles'.[61] By jettisoning the focus on production that persists even in concepts such as the 'social factory', the idea of struggles in circulation more clearly recognizes the means of resistance of 'surplus populations' – often racialized and gendered communities – that are entirely or partially excluded from waged work.[62] It also affirms the eminently material importance of circulation to capital, and hence to struggles against it.

However, as Michelle Liu and her co-authors (including an author of this book) argue, circulatory flows include the social media and mobile phone networks of platform capitalism.[63] Both despite and because of the very real issues of surveillance, mis- and dis-information, trolling, hacking, bots, acceleration, all contenders for large-scale political mobilization had very little choice but to engage in the fight for networked visibility and voice. As protests fill streets and squares, they also invade social media and digital networks. Although in some ways this represents a continuation of the cyberphysical activism of the Occupy period, the uprisings of 2018–21 –

whose violent encounters with security forces were protracted over weeks, months or even years, and distributed throughout large, complex urban spaces – draw a jagged, asymmetric line of division across the CCC platforms, demonstrating fierce contestation between ‘riot platforms’ and ‘police platforms’.[64]

Established social media companies such as Facebook and Twitter remained important, aiding rebellions in France and Lebanon. Increasingly, however, these platforms were traded for or accompanied by newer ones, as the CCC’s own commercial development dynamic left security forces struggling to keep pace with protest formation. TikTok became the preferred communication channel in youth-led movements in Colombia, Thailand and Russia. Surveillance and counter-surveillance became a crucial issue in confrontations between police and protesters taking place in so-called ‘smart cities’, laced with sensors and cameras. In Hong Kong, protestors pioneered the use of lasers to disable state-deployed facial recognition systems and drones – a tactic that then spread throughout the world.

‘Sousveillance’ – de-anonymizing and sometimes doxing law enforcement, documenting instances of brutality, and instantaneously disseminating information that the authorities would prefer to keep secret – became a major form of resistance. Riot movements also relied on apps that used end-to-end encryption, including services like WhatsApp, Signal and Telegram, as well as VPN services. Their availability was a legacy of the Occupy cycle of struggles and the revelations of Edward Snowden, which forced privacy measures on embarrassed commercial providers. In 2019, Chilean students used WhatsApp to organize mass turnstile-jumping demonstrations in response to rising metro fares. Providing on-the-fly, anonymous and encrypted digital riot coordination, Telegram was essential to Hong Kong’s ‘be water’ strategy. The organizing of action through digital communication systems was integral to the ‘infrastructure of

resistance', from the distribution of supplies to the coordination of legal observers, the provision of childcare, and the work of crisis-response teams.[65]

States responded with a coercive computational apparatus now supplied by a profitable police-industrial complex.[66] Between 2018 and 2021, Ecuador, Iraq and Iran saw near-total blackouts of digital networks amid rising unrest. In Hong Kong, Telegram users experienced blackouts that were likely caused by hackers employed by the Chinese government.[67] Protesters around the world increasingly faced state-sanctioned Big Data analytics: law enforcement deployed drones equipped with facial recognition technology to identify those suspected of criminal activity; social media feeds were scanned to pre-empt public assembly; mobile phones were confiscated and forcibly opened; communication channels and platforms were hacked. In addition to these digital weapons of state power, new anti-riot laws were introduced, and older legislation was revived to expedite prosecution.[68]

Police also recruited volunteers to assist in digital defence tactics. As a political form, the riot is adaptable to myriad uses and ends – perhaps to a greater degree than Clover and other contemporary riot theorists have so far recognized.[69] Riots typically begin from below, but are then met with a violent backlash, either from the state or a combination of state and paramilitary forces. 'Electronic armies' in Syria and Iran surveilled and hacked dissidents' online activities. India's BJP-led government called on Hindu nationalists to weaponize social media against demonstrators protesting a new Islamophobic citizenship law, with bloody consequences.[70]

When the Black Lives Matter revolt emerged, ignited by the murder of George Floyd in 2020, it immediately gave rise to activism in the spheres of riot power, police power and counter-riot that were already manifest worldwide. BLM was constituted in and by a collision between the digital

capacities of ‘hashtag activism’ and the Ferguson rebellion of 2014.[71] The 2020 insurrection included multiplatform organization of protests and other events, high levels of online legal and logistical support, the hacking of police records and databanks, and transnationally networked circulation linking BLM with activists from protests in Chile, Hong Kong and many other parts of the world.[72]

Demonstrators battled law enforcement, who in turn refined predictive policing and facial recognition software, reinforcing systemic injustice and violence against Black people. Such surveillance tactics aided in the prosecution of protesters suspected of looting, destroying property or defying police. Vigilante forces were also recruited to aid in the counter-strike; President Trump took to Twitter to incite white supremacist militias.[73] The combination of state forces and police auxiliaries armed with semi-automatic weapons proved lethal in Kenosha, where two demonstrators were fatally shot.

The activation of such paramilitary involvement peaked on 6 January 2021. Over a thousand Trump supporters, organized through social media platforms and encouraged by the outgoing president himself, usurped Washington’s Capitol Hill in response to what they perceived as a ‘stolen’ election. Five people died in connection with the event, one of whom was a Capitol officer, and countless others were injured. The US media widely denounced the incident as a riot. Populated mainly by white professionals and blue-collar workers suffering from prolonged economic crisis, the failed insurrection should indeed be considered a ‘white riot’ motivated by racism, fear of progressive politics, and QAnon conspiracy theory. Like their radical counterparts, reactionary rioters relied on a ‘media ecology’ to mobilize their cause. In addition to Twitter and Facebook, participants organized through right-wing social media sites like Parler, Gab, TheDonald and MeWe.

Unsurprisingly, the initial police response to the Capitol Hill riot was staggeringly weak compared to the militarized approach to the BLM protests only months before. Many rioters were not only current or former military themselves – and thus inherently aligned with state interests – but as a group were simply responding to Trump's call to action. Over 600 would-be insurrectionists were eventually tracked and arrested. Much to the chagrin of the former president and 'King of Twitter', he and countless of his supporters involved in the uprising were deplatformed by CCC companies. Such decisions, made by social media executives, further complicated the left's engagement with issues related to digital communication, disinformation and censorship.[74]

Elsewhere, other charismatic 'strongman' leaders, such as India's Narendra Modi and Brazil's Jair Bolsonaro, had also shown how social media could be used to mobilize support for right-wing governments, and how such mobilizations could explode into violence. Indeed, a coup attempt very similar to the US Capitol Hill event occurred in Brazil in January 2023, following the victory of leftist candidate Luiz Inácio Lula da Silva over Bolsonaro. Supporters of Bolsonaro stormed key government buildings in the capital, Brasília. They seem to have been inspired by the internet imagery of the Capitol Hill insurrection, and to have coordinated their own uprising on social media, including not only major CCC platforms such as Facebook, WhatsApp and YouTube, but encrypted Telegram channels and Brazil's own Twitter-like site, Gettr, founded by a former Trump aide and favoured by Brazilian far-right activists.[75] Like Trump's followers, Bolsonaro's insurrectionaries were ultimately unsuccessful.

WORKER STRUGGLE REDUX

As riots and uprisings unfolded around the world, the workforce of the CCC, generally imagined to be so content with high-paid tech jobs as to be immune to labour activism, was also stirring in unanticipated ways. There were four main currents in this sudden-onset militancy: a series of gig-worker movements, largely but not exclusively among drivers and delivery workers; the organizing efforts of Amazon workers; a ‘techie’ revolt in Silicon Valley and other CCC headquarters; and a global wave of litigation by platform content-moderators.

In 2016, a group of London food couriers working for Deliveroo held a day-long strike protesting their employer’s new pay plan, which would potentially push drivers’ earnings below the minimum wage. This was the first in a wave of similar actions in the UK, Italy, France, Germany and Spain, which spread to delivery companies such as Uber Eats, Foodora and Glovo.[76] Demands concerned pay rates, working conditions and recognition as employees rather than independent contractors. Organization was often undertaken through small, radical unions. Tactics took advantage of the lack of on-the-ground supervision provided by algorithmic management, and of riders’ familiarity with encrypted phone apps and their ability to orchestrate collective ‘logouts’. By 2019 delivery drivers in South Africa and China were striking, and a Transnational Courier Federation had been established.

At the same time, labour unrest erupted in the company that had given a generic name – ‘Uberization’ – to the insecurity of the gig economy. Uber drivers in London, Los Angles, Toronto and Johannesburg began contesting their classification as independent contractors, demanding rights and protections including a minimum wage, job security and basic employee benefits. In 2019, an attempted ‘global strike’ by Uber drivers ahead of the company’s stock market IPO debut produced small stoppages and demonstrations in cities in the United States and the UK. Rideshare Drivers United joined Gig Workers Rising and Mobile Workers Alliance to

advocate for AB5, a California bill that would extend worker classification to Uber and Lyft drivers.

The legislation passed, but was then overridden by a state referendum into which Uber, Lyft, Instacart, DoorDash and Postmates poured perhaps as much as $200 million to persuade voters to revoke the drivers' 'worker' status. However, in 2021, the UK Supreme Court upheld a ruling that Uber drivers are workers, not independent contractors. In the Global South, Uber drivers struck in Kenya, Indonesia and Brazil. In India, meanwhile, there were strikes by drivers for both Uber and its main competitor, the Indian company Ola.[77] In China, where Uber is banned, drivers for its national equivalent, Didi, have disputed algorithmic management with wildly ingenious disruption tactics.[78]

Amazon warehouses, with concentrations of employees in high-pressure, high-stress and high-injury jobs, had long been identified by labour activists as potential sites of union organization. But Amazon's aggressive anti-union policies, relentless managerial surveillance and intentionally high worker turnover rate were formidable obstacles. Nonetheless, in 2013, workers at two German fulfilment centres in Bad Hersfeld and Leipzig went on strike, demanding better pay and working conditions. Strikes and union organization started to spread through other fulfilment centres in Germany, Poland, France and Italy, and a cross-border network of Amazon activists coalesced. Many wondered whether its work could spread into Amazon's US homeland, where unions had for decades been reeling from right-wing anti-union politics and corporate counter-organizing against labour drives.

In 2018, Bezos made a pre-emptive move to prevent contagion, increasing the minimum wage for US Amazon employees to $15 an hour. In February 2021, a union certification vote in an Alabama fulfilment centre staffed predominantly by Black workers failed, defeated by a full-court-press anti-union drive by management. But on 1 April 2022, in Staten Island, New York, where predominantly white managers oversaw an

ethnically heterogeneous labour force, Amazon workers voted for unionization. Labour organizers across the country attempted to develop the momentum this opening facilitated. At the time of writing, however, the question of how far Amazon unionization and worker militancy will go in North America remains open.

A more unexpected outbreak of worker militancy emerged at Google. The company's famed Silicon Valley headquarters, the Googleplex, with its free meals, massages, recreational facilities and other amenities, had long been regarded as epitomizing the attractions of high-tech work, while the company's 'Do no evil' slogan announced its purported ethical commitments. No trade unions would seem to be necessary here. Yet, from 2018, the company's relations with its highly skilled, well-paid workers descended into a state of crisis that journalists described as an internal 'civil war'. The conflict had multiple converging causes. It began with Project Maven, a contract with the Defense Department to work on image recognition for US military drones, at that time deployed over the battlefields of Afghanistan, Iraq and Syria. Hundreds of Google employees signed a petition objecting to the project, and then resigned. Google withdrew from the contract but would not foreclose the possibility of future Pentagon work. For a few months, a wave of similar objections to CCC contracts with military, police and immigration agencies swept the Valley, but then subsided.

At Google itself, however, the conflict catalysed further expressions of worker discontent over gendered and racialized pay disparities and sexual harassment. In 2018, the 'Google Women's Walkout' saw Google employees leave their workplaces in protest against a multimillion-dollar golden-parachute retirement deal given to an executive accused of assaulting a female employee. The company promised harassment policy reforms and greater transparency on pay-equity issues; but within a year

three of the women who had organized the walkout left, claiming they had suffered career-blocking retaliation.

The conflict was then further escalated by the firing, or coerced resignation, of Timnit Gebru, a Black woman and prominent AI ethicist, who had written a paper critical of racial bias and ecological harms in the AI research to which Google was heavily committed. This was followed by the resignation of Gebru's research team co-leaders, Margaret Mitchell and Samy Bengio. Meanwhile, the tide of discontent was sweeping through other parts of Google, with demands from the 'non-permanent' contract staff, who did not share the stock options, regular salaries and other perks of full-time Googlers. As the Google 'civil war' proceeded, unionization became a topic of discussion, and some were fired for organizing. Some victories can be attributed to the Alphabet Workers Union, a union intended for all types of workers at Alphabet, but its membership remains limited to a tiny fraction of Google's workforce. However, its existence, and the turbulence out of which it emerged, has punctured the CCC's confidence that it can take the loyalty of its high-tech workers for granted.

The fourth strand of worker revolt is that of the content moderators employed by CCC companies, usually as contractors, to detoxify internet content from imagery and text concerning murder, suicide, sexual violence, child molestation, bestiality, animal torture, car crashes, beheadings and other horrors that would render their platforms unsuitable for commercial purposes, and in particular advertising. The CCC had promised to filter such content by means of AI but has in fact proved unprepared and unable to do so. It therefore resorts to human moderators, working online for sustained periods of time, very quickly viewing, categorizing and arbitrating torrents of deeply disturbing communication. Profit-maximizing priorities dictate that this labour force should be employed at as low a cost as possible, and with the least liability to the corporate end user of their labour.

In January 2017, two former Microsoft content moderators who had worked in the Washington area filed a lawsuit against the company, alleging that their viewing and reporting of explicit and disturbing content caused them to suffer PTSD. It became apparent that the issue of moderators' exposure to 'anxiety, depression, paranoia' probably occurred on the largest scale mostly in the Global South.[79] Between 2012 and 2021, Facebook 'hired at least 10 … firms globally to sift through its posts, along with a wider web of subcontractors'.[80] When reports of moderators' mental-health problems began to seep out, at least one subcontractor – Cognizant – abandoned the field. Others, including Accenture, which employed more than one third of Facebook's 15,000 content moderators, with its largest aggregations in Manila, Mumbai and Kuala Lumpur, continued, jury-rigging makeshift 'wellness coaching', and counselling workers to 'take a walk' or listen to soothing music.

Eventually the situation boiled over into public scandal and litigation. In 2021, a California judge approved a settlement worth $85 million between Facebook and more than 10,000 content moderators who had launched a class-action suit against the company for failing to protect them from psychological injuries resulting from their exposure to graphic and violent imagery.[81] While Zuckerberg again promised intensified reliance on AI for content moderation, Facebook's computer scientists conceded that, despite real improvements in automation, it was far from a complete solution. Meanwhile, litigation over exposure to toxic content from both content moderators and data labellers for machine-learning feeds continues to be initiated – launched by workers in the Global South not only against Facebook but also other platforms, including TikTok and Microsoft's client think-tank, OpenAI.[82]

These struggles, waged by disparate groups of CCC workers, followed varying trajectories, which sometimes overlapped to generate cross-sectoral affinities. Food couriers expressed solidarity with Amazon workers, while

some full-time Googlers supported part-timers. Within and across these burgeoning conflicts, news and mutual aid spread rapidly and internationally, not least because of the familiarity of workers with apps and digital devices. Academics and activists witnessed the mobilization of the workerist 'circulation of struggles' – a theme developed strongly by the online journal *Notes from Below*, which has mounted an impressive analysis of 'digital workerism'.[83] What differentiated this round of worker struggles from those initially celebrated by autonomist theorists, however, is that this was a circulation of struggles among workers whose job was to produce circulation. Circulation was not just an ancillary process connecting revolts at the point of production, but was itself now a fighting front of labour resistance to capital.

ANTAGONISM, ARSON AND AUTO-COMBUSTION

Throughout the early 2020s, the mutually reinforcing combination of hyper-commercialism, cyberfascism and escalating political and cultural conflicts made the great social media sites of the CCC ever more controversial and unpleasant. It was commonly observed that the internet had become a sinkhole of toxicity in which to communicate was to be exposed to attacks, trolling, hacking, phishing, catfishing, deepfakes and doxing on sites and forums where opinion, especially around race and gender, had rapidly polarized. Platforms often appeared either indifferent to this behaviour or unable to control it, while algorithmically capitalizing on its intensity. At the same time, attempts at moderation themselves became an object of vituperative controversy, ratcheting up the level of animosity that pervaded the network. Participation was at once socially necessary, psychologically compelling, and yet persistently disturbing or even traumatizing.[84]

The CCC's social media systems of messaging, surveillance and advertising have become a force field attracting a chaotic array of social

enmities. In a stagnating world-capitalism, digital conflicts unfold not so much as a ‘circulation of struggles’ (in the sense of a necessarily progressive networked uprising), but as varied series of circulatory antagonisms involving manifold actors: anti-corporate protesters, cyberfascists, and digital supercops. As this medley of conflicts unfolds, all parties have increasing grounds for complaint about the oligopolistic owners of the CCC, who, having profited handsomely from the very conditions that promote this social turbulence, are now caught in the turmoils of general capitalist decomposition. In this sprawling scene, there are still many positive possibilities, such as those emerging from the struggles of workers in the CCC itself, rebelling against the conditions of their own circulation-producing labour. But the full scope of this process cannot be assessed without considering the place of the CCC in the planetary circulations of war, ecological crisis and pandemic, to which we turn in the next chapter.

4

Biospheric Circulations

The circulation of commodities is today changing other circulations: the circulation of pathogens; the circulation of water supplies; the circulation of atmospheric gases, such as carbon dioxide; the meteorological circulation of rain, drought, storms and wildfires. Through crises of pandemic, climate change and biodiversity, these biospheric circulations are now deeply, perhaps disastrously, entangled with capitalism's technological systems.

This requires some amplification of our concept of circulation. When Marx wrote of the circulations of capital, he meant this model to apply to a world market whose features were already becoming apparent in the imperial and colonial expansion of European powers. His references to the communications and transportation technologies of his day – steam ships, railways, and telegraph (the 'Victorian Internet') – allude to this.[1] According to Marx, technologies expand the scope of capitalism and its search for resources. By rapidly connecting distant locations – the 'annihilation of space by time' – they accelerate the pace of life.[2] At the same time, Marx noted that such advancements connected workers of the world and could therefore assist in the struggle against capital. These, however, are fragmentary observations. Marx's plan for *Capital* included a whole volume on the world market – a volume he never completed.

The task of anatomizing how the circuits of a worldwide capitalism functioned was left to later Marxists, from Rosa Luxemburg and Leon Trotsky, who analysed the 'combined and uneven' contours of a capitalism characterized by vast regional disparities; and to world systems theorists

like Immanuel Wallerstein and Samir Amin, who mapped the relations of ‘uneven exchange’ between a ‘core’ of dominant capitalist powers and a subordinate ‘periphery’ of zones supplying cheap labour and resources. Other Marxists continued these explorations into the era of the Soviet Union’s collapse and global capitalism’s apparent triumph, charting the emergence of post-socialist economies in Russia and Eastern Europe – as well as the complicated case of China, whose economic ascent hybridizes both socialist and capitalist elements.

This work has expanded the political-economic analysis of the circulation of commodities. But it has also added new and terrifying dimensions. Marx and Engels were well aware of the role of war in the rise of capital, and of the way rivalries in trade – that is to say, commodity circulation – ignited geopolitical conflicts between nations and empires, escalating the exchange of commodities into an exchange of fire and death. But they never had to confront the cataclysmic violence of the wars of the twentieth century, or the possibility of nuclear annihilation, made all too real following the atomic bombing of Hiroshima in 1945. Cybernetics and the development of the internet were integral to such destruction. And while it was widely imagined that an era of social media and streaming video had helped to leave the martial legacy behind, this is very far from the case.

Maurizio Lazzarato argues that, under capitalism today, ‘war has become a part of circulation’, as the seedbed for circulatory technologies (such as the container transportation of the logistics sector, perfected in the Vietnam War) and the military threat wielded to secure global routes for the circulation of commodities – as, for example, the US and China vie for control of shipping channels in the Pacific Ocean.[3] Today, trade wars between competing national capitalist blocs over dominance in high technology not only shape the transnational cyber-circulation of commodities, but also extend to the waging of cyberwars, increasing the potential for conflict between nuclear powers.

The combination of commercial and military operations, made possible by the CCC, animates the Foucauldian concept of ‘biopolitics’, or the power to control populations. We will examine more deeply how the CCC invests itself in the state’s biopolitical regimes later in this chapter, but it is important to note that both Marx’s and Foucault’s analyses inform our understanding of the CCC as a complex web of bodies, commodities, bureaucratic infrastructure and digital channels – all of which impact the functioning of the world market.

These disturbances have been the work of the titanic machinery capitalism developed to expand its production and circulation. Starting with the use of steam-powered machinery in the eighteenth century, it launched a sequence of earth-changing, terraforming, fossil-fuelled technologies that raised industrial productivity to previously unimaginable levels, creating the conditions for modern life. This simultaneously set in motion ecological crises whose full depth and intractability are only now becoming fully apparent.

Such ecological issues were for a long time not considered part of Marx’s analysis of circulation. But recent work by scholars such as John Bellamy Foster, Jason Moore, Kohei Saito and Andreas Malm has altered this assessment. Drawing on observations throughout Marx’s published works, as well as his unpublished notebooks, these eco-Marxists show how Marx conceived of human society as a ‘metabolism’ in ceaseless, interactive energy-exchange with its environment. In capitalism, this metabolic exchange between humanity and nature involves the circulation of commodities and money, while also simultaneously, in Marx’s words, ‘upsetting the naturally grown conditions for [the] circulation of matter’.[4]

Digital technologies extend this trajectory of technological development. As a consortium of information technology and environmental scientists reviewing the planetary impact of digitization observes, ‘The introduction of digital means of processing and circulating information accelerated the

extraction and mobilization of natural resources, the production of goods and their often wasteful consumption, the globalization of trade and finance, and, in turn, the anthropogenic impacts of these activities on the Earth system.'[5]

However, as this review notes, because of digital technologies' potential use and coordination of renewable, rather than fossil-fuel energy sources, they are also looked to as mechanisms to alleviate environmental impacts, and feature centrally in promises of a green, clean capitalism.

In this chapter we examine the CCC in relation to these issues of planetary biocirculation. We start by exploring how the expansion of the world market has not only enlarged the CCC, but also generated a rival – China's digital complex. This is an issue of economic and geopolitical competition, but because of the danger of such competition spilling over into military conflict, it also carries the threat of an ultimate ecological disaster: nuclear war. We then examine the CCC alongside the Covid-19 pandemic and the ongoing climate emergency. In both cases, the CCC plays a contradictory role: it contributes to the creation of crisis while serving as part of capitalism's crisis-control systems. We conclude by looking at how the convergence of military conflict, the Covid-19 virus and climate change has thrown the CCC itself into crisis, and point to its possible reconfiguration in a context of increasingly biohazardous capitalism.

GLOBAL SCALE

In 2010, photos of tall, bleak, shadowed buildings festooned with netting flashed across digital screens around the planet. They showed dormitories in the factory complex of the firm Foxconn, in Shenzhen, southern China. The nets were to halt the suicides sweeping its electronics-assembly workforce. Young migrants from rural areas – living on-site in crowded rooms, working under quasi-military discipline with mandatory overtime,

and making wages at a fraction of Western rates – were leaping to their deaths to protest these conditions. What made the photos scandalous was that these workers were assembling iPhones.

Apple distanced itself from the situation at Foxconn, but labour conditions in subcontracted factories in China, including the use of child labour and unpaid student interns, continued to embarrass the US corporation. Underlying this situation was a brutal equation: despite significant rises in the wages of Chinese workers after 2010, production costs for a 2019 iPhone X (sold in the US for $999) amounted to $370 for components, but only $24 for labour. Every iPhone sold made $603 of profit for Apple – some 245 times its labour costs, and twenty-five times the ‘rate of exploitation’ that Marx discovered in the steam-driven textile factories of his time.[6]

The rise of the US-based CCC took place in an era when America appeared to dominate the world economy. Capitalism had won the Cold War against Soviet-state socialism, and the Washington consensus seemed set to impose free trade across the globe, reducing governments’ capacity to regulate their own economies as a condition of participation in the global market. This unimpeded flow of goods and information through global supply chains and networks was both the premise and the product of an increasingly circulatory capitalism. It enabled the global ambitions of Google and Facebook to shape information and social relations, the planetary proliferation of Amazon fulfilment centres, and Apple and Microsoft’s offshoring of electronics assembly work. But within two decades, this apparently smooth planetary marketization was shaken by intensifying inter-state, and intra-capitalist conflicts – economic and military upheavals in which the CCC was inexorably entangled. Many of these conflicts centred on China.

After the apparent global triumph of capitalism, the Chinese Communist Party (CCP) adopted economic policies blending socialist central planning

with free-market enterprise. These policies sacrificed equalitarian Communist commitments but propelled the country's staggering economic growth to such a rate that China was widely anticipated to overtake the United States as the world's largest national economy by the mid 2030s.[7] We are not going to arbitrate the long-running Western debate as to whether China's economy is today a form of state capitalism or can still be considered socialist – in our view, this is an issue still in practical contention whose outcome will be determined by political struggles in China. What is clear, however, is that, while the CCP accepted low-wage subcontracting by Apple, Microsoft and other Western companies, it did not intend to submit to the global hegemony of the US CCC.

The Chinese state did not want its citizens to have unrestricted access to the internet, which it regarded, not without reason, as a conduit of Western propaganda and espionage. A system of national internet regulation, referred to in the West as 'the Great Firewall', monitored and censored digital networks, blocking sites carrying 'antisocial' content – such as gambling or pornography – or dealing with volatile political issues. The construction of this apparatus was strongly influenced by Chinese cyberneticists, who had studied the work of thinkers such as Norbert Weiner on issues of control and communication, and whose applications of such thought demonstrated its most repressive potentials. Reports on events like the Tiananmen Square massacre, conditions in Tibet, or, later, the repression of the Uyghur Muslim minority were blacked out. The dissemination of dissent or attempts to evade network censorship could be prosecuted as criminal offences; enforcement was uneven, but chilling.[8]

These policies created friction between the Chinese government and American digital corporations eager to break into China's vast population of potential consumers. After recurrent conflicts with the CCP over censorship, Google abandoned its efforts in 2000. Facebook and Twitter were also blocked by the Great Firewall. These rebuffs were fiercely

denounced in the West as human rights violations, at least until Edward Snowden's revelations about NSA surveillance in the United States. Despite the censorship, by the early 2000s China's population enjoyed relatively extensive internet access and mobile phone ownership; state repression notwithstanding, Chinese citizens often slyly and skilfully used these technologies to criticize their rulers. Moreover, the CCP, determined to see the nation develop its own domestic digital industries rather than just provide cheap labour to Western companies, was for a time willing to allow the country's technology sector to function as a domestic capitalist enclave. China's tech sector grew in a cutthroat, deregulated, hyper-competitive environment that rivalled Silicon Valley's Wild West. At the same time, it was protected by the exclusion of foreign competitors. Before long a set of digital companies emerged that not only emulated the US CCC, but in some ways surpassed it.

These corporations included the search engine firm Baidu, China's Google, founded in 2000; the online retailer Alibaba, China's equivalent of Amazon, established in 1999 by the charismatic entrepreneur Jack Ma, and later the rival online retailer JD.com; and Tencent, a company combining social media with online gaming, but whose super-app Weibo, a ubiquitous walletless payment system, exceeded in scope anything the American tech sector offered. Gig-economy ride-hailing and food-delivery services were ruled by a duopoly of Alibaba-owned Ele.me and Tencent subsidiary Meituan: their drivers delivered billions of orders a year in some of the largest cities in the world. Alongside these equivalents to Western CCC corporations came other forms of digital enterprise, through which China placed its own stamp on cybernetic capital. These included Pinduoduo, a giant online retailer aimed specifically at low-income rural and small-city dwellers, and Temu, another online shopping site specifically directed at cross-border sales – at first within Asia, and then in the United States; by

2023 Temu's advertisements on Google and Facebook were significantly boosting those companies' revenues.[9]

Technological innovations adopted slowly and speculatively in the West – such as fully automated stores, drone delivery and the use of blockchain – often pushed ahead more rapidly in China.[10] Alongside social media and gig-economy platforms emerged digital hardware companies: 'China's Apple', Xiaomi, a mobile phone, smart home device and drone-making company; Lenovo, whose laptop computers sold globally; and Huawei, a worldwide giant in telecommunications infrastructure, and the planet's second-largest mobile phone producer. Backing these enterprises, and aimed at social infrastructures and military purposes, were ambitious government programmes funding digital development, especially in AI – a field targeted by state planners with the goal of making China a global leader by 2030.[11]

Chinese firms were not as large and powerful as those in the United States. In April 2020, Apple, valued at $1.2 trillion at the time, roughly equalled the combined valuation of the top five Chinese tech companies.[12] Nonetheless, China was not only developing its own CCC, but beginning to compete globally with the United States. Though China remains a country with only about one sixth of the average annual income of America, US leaders' alarm about its economic power rose throughout the 2000s.[13] China's exports to the United States and US 'job loss' to China were both declared too large. Industrial and military espionage by Chinese hackers was a sore point, and soon there was talk of a 'New Cold War'.

The Obama, Trump and Biden administrations all imposed trade tariffs and sanctions against China, particularly its tech companies. A standout case was that of Huawei, which made more smartphone handsets than Apple and supplied nearly a third of the world's telecommunications equipment. Especially worrying to US politicians was Huawei's leadership in the high-speed 5G digital networks vital for AI, VR, and autonomous

vehicles – fields in which US telecoms had fallen behind. US security experts claimed Huawei's network software contained 'back doors' giving China's military access to US defence and industrial systems – a possibility of which they were aware because, according to Edward Snowden, the NSA had installed such technology in Western computing equipment purchased by China.

In 2012, Obama banned US companies from using Huawei's networking equipment, and asked US allies to do the same. In 2019, Trump banned US companies from supplying Huawei with crucial computing components, especially microchips. In 2018, Meng Wanzhou, daughter of Huawei's founder and the company's chief financial officer, was detained at a Canadian airport and charged with violating US sanctions against Iran. In retaliation, China arrested two Canadian businessmen on espionage charges. The situation was only resolved in 2021 by the release of all parties. Meanwhile, US sanctions all but strangled Huawei, causing a massive drop in its global sales and revenues for several years until the Chinese company established alternative sources of supply.

Such alarms over telecommunication were followed by social media scares. In 2018, a US national-security panel scrutinized the platform Grindr, used for hookups between gay men. Its ownership by a Chinese gaming giant, Beijing Kunlun, raised fears that the data it generated would be used by China to blackmail military personnel; Grindr was quickly sold to a US buyer. A far larger problem was posed by TikTok, famous for its short user-made videos, and by 2018 among the most widely downloaded apps in the United States, surpassing even the popularity of Facebook, WhatsApp and Instagram. TikTok's business model – surveillance-driven micro-targeted advertising – mirrored that of Meta, Google, Twitter and other US CCC platforms. The difference, however, was that TikTok came from abroad, and its owner, ByteDance, was the first globalized Chinese social media company.

Again, anxieties that its data would be used by Chinese spies – partly confirmed by a 2022 report of TikTok postings used to prosecute Hong Kong protesters – spurred a US state investigation. However, dealing with TikTok, a platform enthusiastically embraced by American youth, patronized by celebrities and marshalled by political activists, was a different proposition from squashing Huawei, a corporation most people in the United States had never heard of. Talk of a US state-compelled ByteDance sale of TikTok to Microsoft came to nothing. However, in 2023, the Biden administration banned use of TikTok by US federal employees, and thirty-four out of fifty US states followed suit, requiring employees to remove the app from their devices. In 2024, President Biden signed into law a bill that would ban TikTok in the US unless ByteDance sold the company to a buyer with no connection to the Chinese government. TikTok and Byte Dance sued to block the legislation, claiming it infringed free speech rights; they were supported by many TikTok users and content creators. As this book goes to press, the case remains unresolved.

Economic and military rivalries were soon ominously superimposed onto the conflict over the island of Taiwan – the centre of production for high-quality semiconductors. While Taiwan is claimed by China, its independence is backed by US support. War over Taiwan threatens a clash between two nuclear powers, which, aside from being potentially world-destroying, would certainly annihilate the CCC's supply of its basic components.

The international dimensions of digital networking were outrunning the parameters of free-trade thinking. Despite differing national policies over issues such as digital surveillance and speech freedoms, the technical administration of the internet by bodies such as the Internet Corporation for Assigned Names and Numbers (ICANN) had for decades managed a shared set of protocols and standards that enabled data to flow around the world. This process survived even as a number of nations increasingly contested

the dominant role played by American and European officials, scientists and businesses in these administrative organizations. Now, however, as national governments pursued economic competition including bans and sanctions, there seemed a real possibility that the internet would become a ‘splinternet’ of fragmented national systems, each not only with its own rules and agencies, but also distinct and incompatible technological architectures.

VIRAL VELOCITY

In early March 2020, the World Health Organization declared Covid-19, a virus whose outbreak was first identified in Wuhan, China, a global pandemic. The announcement vividly demonstrated the connection between biospheric circulations and the circulation of capital, showing how humans are, in the words of medical philosopher Hub Zwart,

> vulnerable beings, thrown into an unpredictable molecular world, a global web of circulation and exchange, haunted by the spectre of newly emerging or unspecifiable risks: the great ‘biological cauldron’ of the twenty-first century. Via international trade, traffic of livestock and food and other forms of connectivity, such as air travel, tourism and migration … the biological existence of people in Singapore or Toronto has become intimately connected (in real time) to the lives of wild bats in China or domesticated ducks in Vietnam.[14]

Huge unknowns hung over the virus’s transmission and lethality. The possibility it would overwhelm medical systems, especially in the bottlenecks of hospital emergency wards, raised the prospect of social collapse. Writing on the unfolding crisis, Chinese scholar of international relations Shang Li remarked, ‘whether the governments could slow down capital circulation and create more distance between bodies and commodities [was] critical to saving not only lives but also the capitalist system’.[15]

In a diametric reversal of neoliberal doctrines of free trade and globalization, over a hundred countries rapidly implemented measures to restrict movement to curb contagion.[16] By April 2020, half the world's population was under full or partial lockdown.[17] However, as two Canadian political economists write, 'proving the Marxian insight that capital is value in motion, lockdown [bred] a new ill … economic recession harkening back to the depths of the Great Depression'.[18] Globally, working hours equivalent to 255 million full-time jobs were lost in 2020.[19] The extent of public relief for unemployment varied across the spectrum of rich and poor nations. Halting shopping, stopping trade and closing workplaces meant bankrupt businesses and desperate households.

In this context, cybernetic circulation became critical to both capitalist managers and the millions of people struggling to survive. In regions where networks were erratic or nonexistent, contagion, illness, lockdown and job loss were braved by billions without the buffer of digitalized systems. But in the advanced regions of capital, where network infrastructures were strong and access to smartphones, laptops and tablets commonplace, life became more intensively online than ever. Social contacts were virtualized; shopping was done on screen; work (for some) was transferred to home; food delivery was ordered by app; and school and university classrooms were digitalized. These arrangements were shaped by the class, racial and gender divisions of capitalism in configurations of inclusion and exclusion, danger and safety, profit and loss.

For the CCC's owners and shareholders, the pandemic was lucrative. US stocks rose as the Federal Reserve took exceptional steps to shore up financial markets and ensure stability for major corporations. Some startups and gig-economy companies were hit hard initially, but the big oligopolists flourished. In 2020, stocks in Meta, Apple, Microsoft, Amazon and Alphabet rose on average by some 44 per cent, accounting for about half of all gains made on the US stock market. At the peak of the pandemic, these

firms accounted for a quarter of the entire value of the S&P index.[20] Second-tier CCC firms, such as PayPal and Snapchat, also did well.[21] New contenders entered: Zoom Video Communication grew its revenues more than fivefold between 2019 and 2021.

Mergers and acquisitions, slowed by revived regulatory scrutiny, took off again in the biggest wave of takeovers and buy-ups since 2015. Uber made a $6.5 biillion bid for food deliverer Grubhub, only to be beaten out by European rival Just Eat Takeaway. Meta purchased a stake in the Indian telecom company Jio and bought animations studio Giphy, though UK regulators later forced it to sell the company. Amazon acquired self-driving-car company Zoox.

The CCC's gains were reputational as well as financial. Before Covid, digital oligopolists in the United States had since 2016 faced a rising 'techlash'.[22] This wave of disenchantment came from many, sometimes mutually opposed sources. It fused concerns over algorithmic surveillance, revulsion at online hate speech, fears of electoral manipulation, objections to corporate content moderation and deplatforming, and protest against gig-economy working conditions. Combining elements from the right and left of the political spectrum, and often seeking contradictory solutions to the problems posed by digital capitalism, it nevertheless marked a significant shift of American public opinion away from its early enthusiasm for the technological innovations and rising stock prices of the CCC.

These companies now delivered daily necessities, enabled social contact, and buoyed the stock market. It even seemed that they might become a major agency of pandemic control: a widely publicized initiative by smartphone rivals Google and Apple promised cooperation on a contact-tracing app that would automatically alert users to contagion exposure. In practice the project stalled amid corporate-bureaucratic problems over data collection and regulation, and was never widely adopted. But for a while it

contributed to a sudden, generalized rehabilitation of the CCC's public image.

In an article titled 'How Tech Won the Pandemic and Now May Never Lose', *New York Times* journalist David Streitfeld observed that the pandemic had made digital capital triumphant in a way even its most evangelical leaders could not have predicted: 'No single industry has ever had such power over American life, dominating how we communicate, shop, learn about the world and seek distraction and joy.'[23] The virus, Streitfeld wrote, had put wind into the sails of the tech companies that was 'so strong it blew tech into another universe of wealth and influence'.

For others, the pandemic was a gale of misery, anxiety and death. The virus starkly illuminated the connection of circulatory capital to social reproduction.[24] In circulation, people shop for goods and services and perform unwaged care labour – cooking, housekeeping, conviviality – transforming these things into vital components of everyday life. Such work is disproportionately assigned to women. Sectors of the economy – hospitality, restaurants, tourism – with many female workers were hit most strongly by pandemic closures. Women therefore often bore the brunt of the abrupt restructuring of daily life in which activities normally conducted in schools, day-care centres, workplaces and stores were transferred overnight into a digital 'overburdening' of the household.[25] These new arrangements also sharply revealed the persistence of 'digital divides' in access to broadband infrastructure, illuminating striking differences between affluent and poor, often racialized neighbourhoods and metropolitan areas. Social division was also manifest in the pandemic work regime. While professionals and technical staff sheltered in place by resorting to telework, millions of others whose work was deemed essential, or simply necessary for their own survival, faced daily contagion risks.

This was nowhere clearer than in the CCC's gig economy. Paola Tubaro and Antonio A. Casilli provide a model of the pandemic risks faced by

various kinds of platform workers.[26] They compose a graph with two axes. One maps health risks, from low to high; the other maps economic risks (such as layoffs and wage losses), also charted from low to high. Those teleworking from home had low economic and health risks. For many others, however, high risks in one or both categories were inescapable. On-demand gig workers such as ride-hail and food-delivery drivers had low economic risks (because their services were in demand), but high contagion hazards.

For online freelancers, the balance between health and economic risks was reversed. Some, offering high-level design or technical services on platforms such as Upwork, might continue garnering income from relatively safe telework. But online micro-workers performing routine tasks, such as those on Mechanical Turk, while shielded from the virus, faced income loss from business closures and an influx of people seeking work-from-home options. Content moderators on social media platforms underwent a staggered risk exposure – first economic, then medical. Facebook, Twitter and TikTok were initially quick to close down moderation work, laying off contract workers. However, as AIs were still incapable of handling many moderation issues, problems soon multiplied. Moderators were therefore often the first employees called back to on-site work, sometimes even when the pandemic was still raging.

Capital enforced work options whose aim was to minimize financial losses and maintain or maximize profits. As a result, labour conflicts already emerging in the CCC, far from abating during the pandemic, were intensified. A major example was Amazon. Bezos's corporation made a massive new wave of hirings to cope with the pandemic-related expansion of its business, as well as offering a hazard bonus and claiming to prioritize worker safety through social distancing, increased cleaning, fever-detecting thermal cameras, masking and other policies. On the other hand, warehouse workers at many sites around the world complained that these measures had

been inadequately implemented, and that management pressure to maintain processing speeds was constantly undermining anti-contagion practices.

The pandemic also created intense problems for the CCC around social media moderation, censorship and deplatforming. Many movements and events that made these issues controversial, such as BLM and the January 6 attack on Capitol Hill, exploded during the pandemic. An additional layer of contention over the nature of the pandemic itself, and the measures to combat it, complicated fierce conflicts over class and race. The CCC helped capitalism to manage the pandemic, but simultaneously became a conduit for mis- and disinformation about its very existence (‘just a fiction’), origins (a ‘Chinese bioweapon’ or ‘Big Pharma plot’), severity (‘no worse than the flu’), treatment (hydroxychloroquine, ivermectin, etc.), vaccines (‘deadlier than the virus’) and lockdowns (‘arbitrary tyranny’, ‘like the Holocaust’, etc.).

To this day, many aspects of Covid-19 are not fully understood – medical knowledge changes over time, and some concerns raised by ‘fringe’ networks have proved to have substance, and some official health advisories have been proved wrong. However, on social media even legitimate questions were often raised as part of narratives generally characterized as ‘conspiracy theories’. Christian Fuchs defines their typical themes as follows: the pandemic was created (either as a manipulative fiction or as a real, bioengineered artefact) by some secret group to increase its power, wealth and control over global populations; resistance required defiance of lockdowns and the rejection of official remedies, including vaccines and masking.[27] Once accepted, these premises are then proved by the supposedly hyper-rationalist cherry-picking of purported chains of evidence.

These narratives had their origins in so-called alternative medicine and wellness culture, in various strands of religious fundamentalism, and in libertarian philosophy. But they were seized on and amplified by the far

right, which articulated them in ways that were strongly inflected by racism (Sinophobic or antisemitic), xenophobia (suspicion of migrants), eugenics (survival of the fittest) and opposition to protective social policies (rights of the sovereign man).[28] Such themes were endorsed and reinforced by politicians of the right such as Donald Trump, Jair Bolsonaro and Narendra Modi – all of whom relied on social media to spur conspiratorial narratives around the virus. These narratives in turn spurred the formation of anti-vaccine and anti-lockdown protests, which were organized through the use of social media. In Canada, a 'Freedom Convoy' of truck drivers and their supporters, which occupied Ottawa and other sites protesting vaccination mandates for nearly a month, was coordinated through WhatsApp, TikTok and Facebook.[29] Other protests against pandemic regulation in London, Berlin and Naples were similarly permeated by social media.

Under centrist regimes, or when the reality and scale of the pandemic became too obvious to ignore, governments asked social media companies to suppress the circulation of anti-vaccination propaganda. At the behest of governments and medical authorities, the CCC attempted to quell these memetic flows. This placed the CCC itself at the centre of a swelling controversy about its powers over public discourse. In pandemic conspiracy narratives, Big Tech figured alongside Big Pharma as a chief villain: the vaccination converted the recipient into a relay station for 5G internet transmissions; Bill Gates was a major architect of a 'plandemic' designed to boost drug company profits, in which he would share. When social media sites started to suppress anti-vaccine propaganda, removing videos and closing accounts, it only intensified controversies around the earlier de-platforming of alt-right influencers.

Conspiracy theories produce personalized, intentional accounts of impersonal system dynamics – occult accounts of the plain-view processes of the world market. Covid-19 was not a plot to rob people of their freedoms, but the collateral damage of capitalist globalization, deforestation

and urbanization necessary for the zoonotic pathogens to overspill into human populations. This global system is not, as QAnon would argue, directed by a club of paedophilic child murderers extracting anti-aging serums from their victims, but it is structured so that wealth, health and longevity accrue to a tiny minority of billionaires (some of whom are sexual predators) at the top of a vertiginous hierarchy of inequality. Bill Gates is not the designer of a ‘plandemic’, but the champion of an intellectual property system that is indeed killing people, not by vaccinating them but by instituting vaccine apartheid. ‘Conspiracy theories’ are themselves the malign by-product of a grossly unjust system, providing mythic metaphors for the reality of capitalism. But these metaphors misdirect animosity against the system, opposing any collectively organized response to crisis, and seek to turn pandemic fears into hostility aimed at foreigners and immigrants, inciting attacks on medical personnel struggling to combat the virus.

The pandemic promoted the CCC to a new level of importance, profitability and power, but also intensified the tensions and conflicts surrounding its control over digital networks. Its major organs – especially AdTech-driven social media and search companies – had established a communication system so widespread and dominant that it supplied the only public information system available in conditions of social emergency. Such a role, which involved recommending certain actions and actively suppressing others, contradicted another role it had assumed: that of a guarantor of free speech, a mission deeply embedded in Silicon Valley mythology. In fact, the real narrowness of the CCC’s commercial imperatives prevented it from fulfilling either role – public information system or free-speech protector – leaving the digital corporations juggling these two competing pretexts for their control over the means of communication, which entailed hasty improvisation on their part. Meanwhile, they succeeded in their primary objective: accumulation.

The rise of the CCC has coincided with intensification of the world market's greatest and potentially most catastrophic failure: global warming.[30] More than half of all CO_2 emissions generated by human activity since 1751 were produced after 1990, when digital devices began to be spread around the world. The period since then has also seen the belated popular recognition of the severity of the climate emergency. Al Gore's alarm-bell film, *An Inconvenient Truth*, came out in 2006, just two years after Google's IPO.

Assessing the CCC's role in the climate crisis is challenging. Digital technologies are generally regarded as a 'wild card' in the planet's thermal fate. Scientific knowledge of global warming depends heavily on computing. A 'vast machine' of global meteorological and climatological measurements gathers data from sensors in the atmosphere, oceans, cities and mountains, and is then processed by the world's most powerful supercomputers to model earth's climate, simulate its dynamics and predict likely changes.[31] It is also frequently claimed that computation can mitigate global warming, replacing travel by carbon-emitting vehicles with screen-time conferences, creating energy-monitoring 'smart homes' and 'smart cities', steering and navigating electric cars, and building 'smart' electrical grids to orchestrate interplays between solar, wind and hydroelectric sources to replace fossil fuels.

At the same time, however, digital networks themselves require electrical energy. The Stack – the layers of interrelated digital operations through which the CCC functions – draws from the Grid – the system of electrical delivery, variously fuelled by fossil and renewable energy, that sustains modern civilization. The CCC's current and future carbon emissions depend on the amount of energy expended in using, making and disposing of computing technologies, and on whether the source of that

energy is fossil-based or renewable. The metrics and methods for arriving at these measurements vary; studies can produce dramatically different results.

As of the early 2020s, the Information and Communication Technologies (ICT) sector was responsible for only between 2.1 and 3.9 per cent of global greenhouse gas emissions.[32] The CCC's cloud-computing and high-bandwidth video-streaming services have increased networks' electrical usage, but this has been compensated for by new efficiencies, such as improved cooling systems for data centres. But studies suggest that the energy demands of global networks are likely to accelerate sharply because of the growth of the Internet of Things (IoT) – the inclusion of micro-computing into everyday appliances; cryptocurrency speculation, which often demands huge computing power; and expanding use of new Artificial Intelligences.

The training of a single natural-language processing AI, ChatGPT-3, is estimated to have consumed 1,287 megawatt hours of electricity and generated 552 tons of carbon dioxide, the equivalent of 123 gasoline-powered passenger vehicles driven for one year.[33] This is for the training alone, prior to its use for millions of queries, each of which is likely to generate higher emissions than if conducted with a conventional search engine. It also takes no account of retraining to update the AI.

As one computer scientist observes, 'a single large AI model is not going to ruin the environment' but 'if a thousand companies develop slightly different AI bots for different purposes, each used by millions of customers, the energy use could become an issue'.[34] Another estimate calculates that the 1.5 million AI servers the company Nvidia plans to ship by 2027 will use at least 85.4 terawatt-hours of electricity annually – more than is consumed by many small countries.[35]

The CCC is therefore not exempt from responsibility in the climate crisis. If ICT greenhouse gas emissions remained constant at 2020 levels while all other economic sectors reduced theirs at the rate recommended by

the Paris Agreement to stay within a 1.5-degree rise in global temperatures, the sector would account for 5.6 per cent of emissions by 2030, 11.5 per cent by 2040 and 35 per cent in 2050.[36]

The corporations of the CCC have responded to this challenge in different ways. One that it has posed special problems for is Amazon, which in 2018 emitted more than 44 million metric tons of carbon – about 85 per cent of the total emissions of Denmark or Switzerland.[37] This is due not only to its warehouses and cloud-computing centres, but especially to the vans, trucks and planes in its 'arriving today' delivery infrastructure. In May 2019, amid the wave of Silicon Valley tech-worker rebellions described in Chapter 2, fifty Amazon workers – Amazon Employees for Climate Justice – presented the company's shareholder meeting with a letter signed by thousands of their co-workers. It called on Amazon to achieve zero emissions, limit fossil fuel companies' use of cloud services, and stop funding climate-change-denying politicians and lobbyists.

The proposal was rejected. Bezos refused to meet the protesters, but subsequently announced Amazon would address climate issues gradually, aiming for net-zero carbon emissions by 2040. In September, 900 unimpressed Amazon workers pledged to leave their desks at the company's Seattle headquarters to join Greta Thunberg's global Climate Strike. The following year Bezos, realizing he had to up his PR game, donated $10 billion to ecological charities, but a chorus of critics suggested that he instead clean up Amazon faster, and pay more taxes so that governments could take effective action on climate change.[38]

Amazon worker environmentalism, concentrated among technical and administrative workers at its corporate offices rather than in its warehouse labour force, subsided during the Covid-19 pandemic. However, when Amazon revealed its 2021 pandemic business surge had resulted in CO_2 emissions 18 per cent higher than in 2020, and 40 per cent more than in 2019, the spirit of revolt was revived.[39] In May 2023, hundreds of Amazon

workers gathered at its Seattle headquarters protesting both the lack of progress on climate goals and an inequitable return to on-site working. This time the demonstration was held in front of the ‘Amazon Spheres’ – three connected glass orbs crammed with more than 40,000 plants from fifty countries on five continents, with lighting, temperature and humidity carefully controlled to mimic an equatorial ‘Amazonian’ environment: precisely the type of environment being destroyed by global warming. Protesters carried signs reading ‘Amazon: Enough short-term thinking. Listen to your Employees: Stop Greenwashing’.[40]

Bezos’s fellow digital oligopolists, unencumbered by a carbon-spewing transportation fleet, could afford to be more ambitious about the climate crisis. Indeed, they seized the opportunity to situate themselves at the forward edge of green capitalism. Google has long declared itself carbon-neutral because it purchases ‘offsets’, supporting carbon-capturing ventures such as forestry preservation to compensate for its own fossil-fuel use. In 2020, its CEO, Sundar Pichai, announced his company would use only renewable energy by 2030. He also asserted that Google had purchased enough carbon offsets to ‘pay off’ the entire carbon footprint accrued since its foundation in 1998.[41] Microsoft upped the ante with what it called a ‘moonshot’ plan to become carbon negative, extracting more carbon from the atmosphere than it emitted by 2030.[42] Apple announced a plan for carbon neutrality by 2030. In 2021, Facebook claimed to have already attained net-zero carbon emissions for its immediate business operations through massive buying of renewable energy and carbon offsets; the company aimed to do the same for emissions across its supply chain by 2030.

These initiatives drew applause, but also scepticism. Carbon offsets of the sort Google and Facebook rely on heavily for their net-zero claims have been criticized for lacking thorough auditing and verification procedures. It is often uncertain whether an offset in fact saves a resource that would

otherwise be lost, how much it saves in carbon emissions and for how long, and whether and to what extent such activity simply games the system.[43] Recent investigations go as far as to characterize the vast majority of carbon-offset plans as 'worthless'.[44] Microsoft's carbon-negative 'moonshot' includes payment for reforestation and biomass preservation, but also depends on development of carbon-capture technologies that do not currently exist, or have yet to be tested at scale. In 2023, President Brad Smith had to reveal that, since the company's moonshot announcement, emissions, far from shrinking, had climbed steeply. Booming corporate growth had driven them up by 29 per cent, to reach 14 million tons of CO_2 – the highest in five years.

A 2023 study of transparency and integrity in climate pledges from twenty-five major firms, conducted by Corporate Climate Responsibility Monitor, includes four of the five Big Tech companies (Meta is absent). Apple received the best rating, of 'moderate' or 'reasonable' integrity, although its long-time contractor, Foxconn, was among the lowest-rated companies. Google and Microsoft received 'poor' integrity ratings – Google because it supplied no evidence about the effectiveness of its carbon offsets, and Microsoft because the 'implementation scale' of its 'innovative new abatement technologies' was unclear. Amazon fell to the bottom the heap; Bezos's promises were panned for their vagueness and inadequate reporting.[45] The record of the giant tech companies in realizing their lofty green promises therefore seems uneven; actual achievements contrast sharply with hypocritical gestures.

Nevertheless, behind the complex calculation of emissions accruing to individual companies is a larger problem: that of the CCC's key role in global capitalism as a whole. We have argued the CCC's role in today's world market is in automating, expanding and accelerating the exchange of commodities for money – through advertising, logistics, shopping, payment and financing. Its mission is to speed the sale of commodities, from high-

tech toys to groceries. Since the companies of the CCC function as conduits for goods and services flowing through the world market, from suppliers operating at very different technological and regulatory conditions, their involvement with carbon emissions massively exceeds what can be directly attributed to them.

Some technical terms used in measuring corporate carbon emissions will illuminate this point. Under the Greenhouse Gas Protocol Initiative, widely used to evaluate emission reductions, there are three ‘scopes’ of emissions. Scope 1 emissions are from sources directly owned or controlled by a company. Scope 2 primarily covers emissions from purchased energy sources. Scope 3, however, is vague and vast, including ‘indirect emissions’ resulting from the transportation, distribution and use of goods and services purchased from a company, as well as those resulting from its investments and finance.[46] The definition and discovery of scope 3 emissions is confusing and opaque, and many corporations would prefer that it remain so.[47] While it is relatively easy for some giant CCC companies to limit their scope 1 and 2 emissions (or at least pretend to do so through carbon offsets), increasing profits and stock values relentlessly raises scope 3 emissions.

For example, digital marketing companies now scrupulously calculate the carbon footprint of advertising campaigns run via Google and Facebook’s high-speed automated auctions. Yet such accounting does not even touch on the role of advertising in sustaining a culture of high-intensity consumption. The UK group Purpose Disruptors argues that to take responsibility for its climate impact, the advertising and marketing communications industry needs ‘to not only measure the impact of its operational emissions (that is, offices, business travel, creating the work and placing the work on various media platforms)’ but also ‘measure and reduce the impact of the incremental consumption it generates’.[48] The group claims that if a measure of ‘advertised emissions’ included the greenhouse

gas emissions resulting from ‘the uplift in sales generated by advertising’, the industry would be responsible for 32 per cent of the carbon footprint of every person in the UK. It therefore proposes that, as ‘architects of desire’, advertisers drastically reduce their spending on ‘fossil fuels, transport such as automotive and flying as well as red meat’.[49] Notwithstanding a debatable methodology, the Purpose Disruptors illuminate the likelihood that the advertising industry – with which the CCC is deeply entangled – underestimates its carbon consumption.

In another example, according to the Center for Investigative Reporting, Amazon’s reported, and already dismal, carbon footprint massively underestimates its emissions. The company only reports those emissions generated through the use of goods it makes itself, such as the Echo Dots, Kindles and Amazon Basics – 1 per cent of its online sales. It omits emissions from products that Amazon buys from manufacturers (such as Levi’s, Nintendo, Frigidaire) and sells directly to the customer, which represent 39 per cent of its total sales, or from the other 60 per cent of sales from third-party vendors. Other retailers far smaller than Amazon report such emissions, giving them a far larger carbon footprint; but Bezos’s giant corporation suppresses this information.[50]

There are many similar cases. It may be possible to track and even curtail the cloud and platform services that Microsoft, Amazon and Google provide to fossil-fuel companies such as Shell; but this tells us nothing about how their cloud computing accelerates the activities of hedge-funds and asset managers who funnel money towards oil.[51] The CCC’s real climate change problem is that it is a sector predicated on the circulatory growth of the world market. In theory, this expansionary commodification might proceed with entirely clean, renewable energy decoupled from carbon emissions – but such a green capitalism must also tend to other aspects of Earth’s ecosystem, such as biodiversity.

In a system where greenhouse gas emissions are deeply embedded in industrial systems, from factory farming to skyscraper construction, the abatement of such emissions appears as an ever-receding mirage. The CCC began its operations at the start of the 2000s. In 2022, global energy-related CO_2 emissions reached a new all-time historical high of more than 36.8 billion tons. This is the achievement of a CCC-enabled world market. Global capital as a whole is failing to curb global warming, and the CCC is an indispensable part of the overheating system.

CRISIS AND RECONFIGURATION

In 2022, the pandemic, war and global warming converged on the CCC, altering the digital landscape in previously unthinkable ways. The explosion of cold war into hot war did not first occur over Taiwan, as many expected, but in Ukraine, where the US adversary-by-proxy was not China, but its old antagonist, Russia. Russia's kleptocratic fossil-fuel state capitalism does not have a CCC comparable to those of the US or China.[52] As Malcolm Harris observes, for Russian oligarchs wanting to make money from computing, the speediest route has been to 'pull value out of Russia and ship it to California', where Facebook, Apple and many startups have benefited from such investment.[53] The key characteristic of Russia's digital capitalism is its subordination to an authoritarian state security apparatus with two faces: control of domestic public opinion and offensive operations against international adversaries.

In disputes with Estonia, as well as wars in Georgia and Ukraine, Russia's digital offensives have made use of network blackouts and disinformation. Digital systems were central to the Russian invasion of Ukraine in 2022, following a ten-year period of low-intensity conflict in the Donbas region. Russia's cyberwar powers proved less overwhelming than many observers had anticipated, due to Ukrainian ingenuity and American

aid in preparing these networks to resist attack. But ongoing hacking, malware and digital sabotage persisted alongside Russian missile and drone attacks on Ukraine's power grids. The conflict became 'the most internet-accessible war in history', with battlefield reports – both real and fake – relayed by Twitter, TikTok, YouTube and other platforms.[54] It also marked a watershed moment for the US CCC.

Unlike China, Russia had allowed Western companies such as Facebook, Twitter and Instagram to operate within its borders, albeit under constant pressure to censor volatile content, surrender data on dissidents, and to store information in Russian data centres and set up Russian offices, making them more vulnerable to intimidation and harassment. Before the war, companies such as Google and Facebook maintained a veneer of neutrality on controversial international issues. Now they faced demands from NATO states to take sides – and rapidly fell into line: YouTube and Facebook blocked Russian state media outlets, such as *Russia Today* and *Sputnik News*, and removed thousands of videos and other content deemed to be Russian propaganda. Twitter reduced the visibility of tweets from such sources. Apple, Netflix and Spotify ceased sales or closed their offices in Russia.

Russia retaliated, banning Facebook and Instagram, while TikTok withdrew most of its content from Russian users. These decisions spawned a host of other concerns, ranging from the political consequences of leaving Russians enclosed in their state's propaganda bubble to the limitations placed on critiques of the West's war effort. The Russian state has emergency plans to establish a 'Sovereign Internet' disconnected from global networks. The 'RuNet', featuring state-controlled clones of US platforms – RuTube for YouTube, RuStore for the App Store – is the ultimate endpoint of 'splinternet' logic, separating itself from the digital circulations of a world market.[55]

The liberal fiction of a planet unified by US-led capitalism was terminally punctured. In 2022, the US Defense Department awarded lucrative contracts to Amazon, Google, Microsoft and Oracle to create the Joint Warfighting Cloud Capability, which would provide the Defense Department with cloud services ‘across all security domains and classification levels’.[56] As the world market disintegrates into rivalrous blocs of capital, with each major power backing its own information sector, conflicts over digital circulation have become part of the ‘savage ecology’ of war – alongside thousands of deaths, the use of deadly cluster munitions, destruction of hydroelectric dams, and the exchange of thermonuclear threats.[57]

As war erupted, Covid-19 was far from over. In China, Apple suffered another embarrassment when workers rioted, and then fled from Foxconn’s Shenzhen iPhone plant. This was only one of a slew of supply-chain problems that beset the CCC, with long-term disruptive effects on production and transportation. However, in North America public attention to the virus was waning. To the surprise of the CCC, which had apparently banked on the uninterrupted continuation of pandemic life-by-screen, demand for its digital services and products showed signs of decline. At the same time, the US Federal Reserve’s attempt to combat post-pandemic inflation by raising interest rates threatened access to the cheap money on which many tech startups – and even CCC giants – depended. In 2022, for the first time in a decade, CCC stocks lost value, declining by as much as a third. While other sectors began a post-pandemic return to work in 2022, CCC companies laid thousands of workers off – a process that continued into the following year.[58]

Meanwhile, extreme weather events signalled the arrival of a full-blown climate crisis, with fires, floods and drought striking with exceptional force around the planet. In July, a heatwave in the UK caused Google’s and Oracle’s data centres to shut down.[59] In September, Twitter’s California

data centre experienced a major outage due to the intense heat.[60] Droughts in Taiwan and typhoons in Malaysia disrupted semiconductor supply chains, contributing to shortages and price rises for basic digital products.[61] In Florida, Amazon shuttered some warehouses in anticipation of Hurricane Ian's devastation. The corporation was already facing lawsuits over the death of six workers in December 2021 when a tornado whipped the roof off an Illinois fulfilment centre; managers had apparently insisted that work continue up to the very minute of the twister's arrival. Amid these unsettling optics, a TikTok tirade from a Floridian Amazon delivery driver required to make 172 deliveries during the height of the storm – 'I hate all of y'all right now!' – went viral.[62] All these were microcosmic indicators of a planetary turbulence threatening capital's global cybernetic circulation, and perhaps pushing towards reconfigurations of the CCC itself.

BIOPOLITICAL POWERS

Global capitalism is running into overlapping biospheric hazards: hot and cold wars, the Covid-19 pandemic, global warming. The CCC is now a major actor in these encounters, albeit in contradictory ways, contributing to both the production of crises and attempts to control them. The power of the US-based digital corporations spurred the emergence of international competitors, notably China's tech sector, and counterforces such as Russia's cyberwar apparatus. This in turn drew the US corporations into the orbit of national-security concerns. In the Covid-19 outbreak, the spread of a virus facilitated by the world market's digitally powered transportation and trade systems provided the opportunity for extraordinary growth in the profits and powers of the CCC. And in the climate crisis, CCC companies have positioned themselves as exemplars of clean, green, renewable capital, despite their ongoing role as a general accelerator of the global commercial growth that propels the climate emergency.

Joshua Herder proposes that the CCC is now a biopolitical force with ‘the means and the intention to govern populations’.[63] This proposition draws on Michel Foucault’s famous thesis that modern governmentality is characterized by the exercise of biopower, ‘power over life itself’. While Foucault himself understood ‘governmentality’ broadly, the concept of ‘biopower’ has most generally been applied to the operations of state power. But the CCC provides a striking demonstration of the biopower of capital. Foucault described how, at the inception of the modern state, one of its most important roles was to secure the circulation of commerce, guaranteeing the safety of trade routes. Marx had already discussed how the building of communication and transport infrastructures was first undertaken by the state, and then privatized as a source of profit. The history of the internet itself – in the transition from ARPANET to Facebook – provides a startling example of this privatizing dynamic.

During the pandemic, Naomi Klein argued that a new phase of ‘disaster capitalism’ had provided Big Tech the opportunity to usurp the functions of government.[64] This idea was taken by the far right as material for twisted conspiracy theories positing a ‘Great Reset’ led by plutocratic elites – theories ultimately aimed at stirring individualist, anti-collective and often racist responses to the crisis.[65] Despite this co-option, it should be recognized that growing corporate influence over governance through state–capital, public–private partnerships, collaboration and hybridizations are indeed ongoing features of twenty-first century capitalism. The crises of the 2020s are likely to see new configurations of state–capital alliances. These partnerships will probably involve the CCC, but some of the main actors may be new capitalist entities better attuned to the extreme, emergency conditions of the world market than the original Big Five tech companies. Two examples are Peter Thiel’s Palantir, and the combined forces of Elon Musk’s three-headed conglomerate of SpaceX, Tesla, and X (formerly Twitter).

Palantir is a data-mining company launched in 2003 by Thiel and four other partners, named after a future-telling crystal ball in J. R. R. Tolkien's *Lord of the Rings* saga.[66] Established with funding from the CIA's well-known front company, In-Q-Tel, and using information-extraction technologies based on the fraud-detection software Thiel devised for his previous company, PayPal, Palantir has developed a long client list, but specializes in contracts with state agencies, and has a declared intent to 'become the default operating system for data across the US government'.[67]

Palantir's list of 'contentious but lucrative public sector contracts' focuses on management and security issues, including battlefield intelligence platforms and predictive policing systems.[68] Palantir currently provides surveillance services to US Immigration and Customs Enforcement (ICE) and operates 'deportation platforms' (which are interoperable with Amazon Web Services), aimed at tracking down undocumented migrants, including climate refugees, for arrest and prosecution.[69] In the Covid pandemic, Palantir was employed by President Trump to monitor contagion. Along with Google, Microsoft and Amazon, Palantir has been enlisted by Britain's National Health Service to create a Covid-19 'data store' drawing on thousands of sources, including anonymized Covid-19 test results and patient information, to predict hospital demand. In 2024, Palantir held its board meeting in Tel Aviv as a gesture of solidarity with Israel in its war against Hamas; its chief executive claimed the company's products had been 'in great demand' since the start of the conflict.[70]

The scope and nature of Palantir's interests, and their consolidation under one corporate roof, have raised concerns about invasion of privacy, civil liberties and the privatization of public institutions. With a market value of $38.28 billion as of July 2023, Palantir is not a 'big' Big Tech company; but its activities suggest a trajectory for the CCC in an era of planetary crisis. Thiel, perhaps the most outspoken intellectual among the

CCC's leaders, is a self-declared right-wing libertarian; in Palantir, however, he figures as an abettor and surrogate for the state control necessary to maintain capitalist circulation as advanced regions of the world market fortify themselves against war, climate migrancy, pandemics and civil turmoil.

More imposing than Thiel's shadowy presence are the assets brought to the state–capital collaboration table by his former business partner, Elon Musk. The scope of these assets was illuminated during the Russo-Ukrainian war, which has relied heavily on Musk's Starlink satellite network. Musk's space venture dwarfs the extraterrestrial tourism of Jeff Bezos. As of 2023, Starlink had more than 4,300 small satellites in orbit, and looks forward to deploying another 40,000. For a fee, they 'beam down high-speed internet to antennas on the ground' anywhere on the planet.[71] Starlink's service was first voluntarily offered to Ukraine by Musk as part of the US military. When he later insisted on payment for its continuance, and also dictated what features would or would not be covered, his demands reportedly resulted in a panicked show of obsequiousness from the Pentagon: the generals had no other supplier of a Low Earth Orbit satellite 'megaconstellation', now regarded as vital to waging both conventional and nuclear war.[72]

Musk's entwinement with the US state has more Earthbound dimensions when one considers Tesla's production of electric, and purportedly AI-directed autonomous, vehicles. Tesla's success is integral to any US government's plans for green capitalist reindustrialization. These plans eschew a revival of public transport in favour of reinventing fleets of millions of privately owned vehicles. Tesla will be central to any such project to an extent that gives Musk an influential voice in planning for electrical and transportation infrastructures.[73]

To low-orbit satellites and semi-autonomous vehicles must be added Musk's $40 billion acquisition of the network now known as X. His 2022

purchase of Twitter proceeded in so chaotic a manner, and with such financially disastrous results, as to be widely and justifiably treated merely as a manifestation of his billionaire vanity and erratic personality. Nonetheless, the acquisition did supply the Musk business conglomerate with control of a well-known, controversially famous social media platform. The new owner's willingness to change its character was swiftly indicated by the reinstatement of far-right accounts that had been closed by Twitter, and the apparent abandonment of content-moderation, which suggested a calculated political agenda.

The alignment and mutual support of satellite, transportation and information flows displayed across Musk's corporate holdings suggests the emergence of new forms of high-technology circulatory capital increasingly proximate to, and interpenetrated with, state military and national-industrial interests. Around SpaceX and Palantir gather a throng of the smaller venture-capital-funded Silicon Valley startups focused on military computational applications, from drones to AI-based targeting, battlefield communication and autonomous weapons systems.[74] Taken together, then, Musk and Thiel may be the face of the CCC for times in which the world market disintegrates into hostile blocs of national capital, pandemics sweep the planet, and 'global boiling' generates increasingly competitive and conflictual conditions of accumulation. The ominous direction of both these leading-edge capitalists' imaginations – Thiel's focus on a 400-acre survivalist bunker bolt hole in New Zealand and Musk's escape from a ruined Earth via SpaceX's project of colonizing Mars – shows a disquieting lack of confidence in the eventual outcomes. We therefore turn in the next chapter to alternatives to either the old or the new version of the CCC.

5

Circulations and Revolutions

Circulation and revolution have a complex relation. Circulation maintains a system, revolution overthrows it. Circulation keeps things going, revolution transforms them. Circulation is what have now: capitalism. Revolution is what we desire for the future: an as-yet never attempted ecological, feminist, decolonizing communism. But this contrast between circulation and revolution quickly becomes complicated. Sometimes maintaining or expanding processes of circulation requires changes in technologies and organization that might be described by their instigators as revolutions, as capitalists often do when speaking of the processes of ‘creative destruction’ by which they attempt to overcome stagnation and rejuvenate profits.[1] What is claimed as revolution may indeed be change, sometimes dramatic change, but is generally change that stabilizes rather than subverts. And revolution itself is a term with strangely circular connotations. Sometimes revolutions that seek to alter society radically – to turn the world upside down – ultimately return to their starting point, recapitulating what they intended to annihilate.

Nowhere has this been more apparent than in cybernetics, a field littered with claims to revolution: digital revolution, information revolution, quantum revolution, crypto-revolution, apparently ad infinitum. These technological revolutions, encompassing everything from the introduction of the personal computer to the popularization of the internet and the advent of the smartphone, have indeed changed everyday life. But they have also

perpetuated, intensified and expanded global capitalism's omnipresent circulation.

Yet, as we have seen, this circulatory process contains problems of social conflict and biospheric catastrophe that suggest either disaster for the system it sustains or a need for radical social transformation, of which truly revolutionary change of the CCC would be an essential part. In this chapter we therefore examine several current ideas about new network possibilities: mounting agitation to 'break up and rein in' the titanic corporations of the CCC; the promise of a new capitalism, or even post-capitalism, founded on cryptocurrencies and blockchains; impulses to refuse and disconnect from digital networks; new proposals from the tradition of socialist cybernetics, and our own preferred variant of that tradition: an agenda for biocommunist circulations.

BREAK UP AND REIN IN

When the CCC emerged from the rubble of the 2008 financial crash, the new tech oligopolists appeared as saviours bearing mobile phones, promising free services, booming stock prices, exciting job prospects and a tech-driven recovery. A decade later, in the wake of the Snowden surveillance revelations, which showed that Big Tech cooperated with NSA spying on US citizens, the Cambridge Analytica scandal exposed the potential for clandestine digital manipulation of democratic processes. Added to this were innumerable privacy breaches and social media toxicity released by waves of racist and sexist trolling – plus the retaliatory censorship by which corporations half-heartedly attempted to contain these outbreaks. All of this took place alongside multiplying reports of exploitation of Amazon workers and Facebook moderators. The bloom had finally come off the tech industry's rose.

By 2018 the ‘techlash’, which fused a medley of criticisms over digital surveillance, hate speech, deplatforming, the precarity of the gig economy, algorithmic discrimination, screen addiction and social-media-derived depression, was well underway – and it was amplified by inter-capitalist tensions. The success of the CCC had come at the expense of what were now sneeringly termed ‘legacy media’: newspapers, radio and television, from which digital advertising, commanded by the Google–Facebook duopoly, had drawn vital revenues. Tech billionaires were now paid back in hostile coverage from not just the left-liberal *Guardian*, but also hard-right Fox News, the flagship of Rupert Murdoch’s global media empire.[2]

With this wave of discontent came demands to remedy the over-weening scale of Big Tech. In the United States, this sentiment marched under the label of ‘anti-trust’, a term originating in late-nineteenth-century populist movements against corporate cartels. As archaic as anti-trust sounds, it was a reminder of the longstanding US judicial and political traditions opposing the formation of monopolies and oligopolies because of their anti-democratic nature. This anti-trust tradition had a record of monopoly-dissolving successes, from the breakup of Rockefeller’s Standard Oil in 1911 to that of Bell Telephone in 1984.

In the later twentieth century, anti-trust activism was eclipsed by the lawyers and economists of the Chicago School, who argued that the impact of monopolies should not be assessed in terms of broad imbalances of social power, but only in terms of economic efficiency, as a matter of ‘consumer welfare’ delivered through low prices. This doctrine was broadly consistent with the Reaganite neoliberal deregulation wave that began the 1980s. A belated attempt by the Clinton administration to extend anti-trust into the digital era with a case against Microsoft’s software monopoly failed. Subsequently, the United States made no serious attempt to curb digital capital’s concentration of ownership; on the contrary, it enthusiastically abetted it.[3] Even the ostensibly progressive Obama

administration enabled the CCC's ascent through minimalist, light-touch regulation, while a revolving door of lucrative appointments connected Washington with Silicon Valley.

However, Big Tech scandals prompted a bipartisan anti-trust revival. Liberal legal scholars such as Lina Khan and Timothy Wu began to apply a 'neo-Brandeisian' analysis – so-called in reference to Judge Louis Brandeis, famous for his late-nineteenth-century fight against railroad monopolies – to the CCC oligopolists.[4] Both Elizabeth Warren and Bernie Sanders campaigned to break up Big Tech during their campaigns for the Democratic party nomination for the 2020 US presidential election, and President Trump made similar calls. His administration commenced two anti-trust cases; one against Google, for compelling mobile phone companies to pre-install its search app; the other against Facebook, for purchasing WhatsApp and Instagram to crush potential competition. A Senate subcommittee also brought forward a sweeping report charging Meta, Amazon, Apple and Alphabet with multiple abuses of power.

Following Biden's victory, his administration emphasized antitrust policy, appointing activist jurists such as Wu and Khan to regulatory positions, and legal actions against the digital giants at both federal and state level have proliferated. Regulators continued the attempt to reverse Facebook's purchase of WhatsApp and Instagram and tried to stop further acquisitions by both Meta and Microsoft. The Platform Competition and Opportunity Act – a bid to secure more rigorous oversight of mergers and acquisitions – was tabled in Congress. Collusive arrangements, such as an alleged advertisement price-fixing agreement between Facebook and Google, and the duopolistic control of app stores by Google and Apple, also attracted investigation.

This explosion of regulatory activity was not confined to the United States. The European Union was already acting against US-owned Big Tech with greater vigour than US regulators – notably with the 2018 introduction

of General Data Protection Regulation (GDPR), a product of simmering discontent over America's digital spying on European politicians, a practice that recalled grim historical memories of totalitarian surveillance. The GDPR required corporations to secure consent for data-gathering, anonymize collected data to protect privacy, provide data-breach notifications, address 'right to be forgotten' concerns, establish rules for safely transferring data across borders, and appoint data-protection officers.

This move merely shaved the top off a vast iceberg of CCC data-extraction, placing far too much responsibility on individual consumers. Nonetheless, the GDPR encroached significantly on capital's control of user data. Because Europe was a rich market, the CCC had little option but to comply; and, though effective enforcement of the new law faced serious obstacles, it inspired other privacy legislation, such as California's Consumer Privacy Act of 2018.

There have been similar anti-trust moves beyond Europe and America. In 2016, India banned Facebook's 'Free Basics' service, which aimed to pull millions of users into a zero-cost walled-garden version of the internet that could be accessed only via the offerings of Zuckerberg's corporation. In 2023, the Indian Competition Commission ruled that Alphabet's pre-installation of YouTube and Google Maps apps on Android phones was an abuse of monopoly power. South Africa's Competition Commission identified Alphabet's dominance of search and the 'unconstrained commission fees' on the Google Play and Apple App stores as targets for legislation.[5] Brazil's Administrative Council for Economic Defense prosecuted Alphabet for its hold on mobile apps, while Japanese and South Korean regulators started moving in a similar direction.[6] Australia and Canada challenged Facebook and Google, seeking compensatory payment from the digital giants for linking to news stories from national media.[7]

Most dramatic of all, however, was China's anti-monopoly crackdown. In its hybrid state-command capitalist economy, the digital sector had been

a notable zone of relative market freedom. Tech companies like Alibaba and Tencent were among the largest in the world. In 2020, however, China's stock market authorities abruptly suspended the IPO of Ant Group, an affiliate company of Alibaba that specialized in financial services. Chinese regulators forced Ant to revise its business model and placed it under close supervision. Alibaba itself was fined ¥18.2 billion ($2.8bn) for abusing its monopoly powers. Jack Ma, the former owner of Alibaba and China's most flamboyant capitalist, vanished from sight for weeks. When he returned, he was silent and subdued.

China's regulators went on in 2021 to summon the leaders of thirteen other tech giants for meetings and announced new oversight of their data-gathering activities, overseas investors and financial dealings. Stocks of Chinese technology companies lost billions of dollars on international markets. At the same time, China's courts condemned the '996' practice of working from 9 a.m. to 9 p.m. six days a week, common in the technology sector; tightened limits on children's online gaming hours; and erased 'misbehaving celebrities' from social media. In the West, some commentators were impressed by China's determined handling of CCC billionaires. But, despite this minority opinion, such measures were more generally denounced as authoritarian interference in the free market.[8] China's President Xi and his officials depicted them as part of a larger campaign to correct the excessive power of the capitalist sector, curb inequalities, limit debt and protect 'common prosperity'.[9]

Outside China, however, tech billionaires may not have had much reason to fear regulatory reform. While it might have dampened some of the CCC's most extreme monopolistic practices, it showed little sign of doing anything to quell their basic profit-maximizing strategies. Opposition to monopoly and oligopoly are free-market positions with the imprimatur of no less an authority than Adam Smith. Anti-trust measures are not anti-capitalist. Rather, they restrain capital from its own self-destructive

tendencies. For many trustbusters, the aim is not to hamper capitalism, but to make it work better, releasing the powers of innovation stifled by over-mighty corporate placeholders.

Thus William Barr, Trump's attorney general, introduced his investigation into Google's abuses of monopoly power, declaring that his intention was 'to create the next Google'.[10] It is not clear, however, that increased competition is the answer to issues such as surveillance, hate speech or gig-economy labour conditions. Since 2020, events such as Elon Musk's takeover of Twitter, the success of TikTok and an outbreak of inter-CCC competition over new forms of AI have complicated rather than resolved these problems. If, as we suggest in this book, the underlying problem with the CCC is not just monopoly but marketization, not just concentration of ownership but the general commodification of life, then anti-trust and related measures such as the GDPR moderate the first dynamic in each case, only to exacerbate the latter.

Furthermore, the enormous wealth and expertise of the CCC companies gives them great power to oppose any restraint. In 2021, Meta, Amazon, Alphabet, Microsoft, Apple, Uber and Twitter spent almost $70 million lobbying the US Congress.[11] By 2023, the Biden administration had suffered severe reverses in key anti-trust cases, including its attempt to break up Facebook, WhatsApp and Instagram. Meanwhile, several proposed pieces of anti-trust legislation failed to gain Congressional support.

Nonetheless, regulators pressed on. In August 2024, the US Department of Justice won an unexpected victory. A judge found Google guilty of abusing its monopoly powers through exclusive deals with Apple and other companies that made its search engine the default choice on their devices. Google promised to appeal the judgment, but large fines, or even the forced sale of some Google assets, may follow. As this book goes to press, the Federal Trade Commission's prosecution of Meta for abusing its monopoly

position in social media continues. Zuckerberg also faces a lawsuit launched by over forty US states claiming that Meta knowingly placed children at risk of exposure to harmful digital material, as well as potential bills from Congress requiring stricter safety measures. In September 2024, Meta tried to pre-empt state regulation by announcing Instagram users under the age of eighteen would be assigned to new ‘teen accounts’ allowing parents greater control over their activities, a system to be backed by AI-run verification and surveillance systems. Microsoft successfully fended off British and US regulators to purchase the giant videogame company Activision; but US government trustbusters began investigating its role, with that of other CCC corporations, in concentrating ownership of AI and cloud computing. The European Union imposed a searing fine of nearly $2 billion on Apple for controlling access to streaming music services through its app store, resisted Google’s attempts to roll back an even larger fine for manipulating digital advertising markets, and charged Meta with distorting the online classified advertising market.

It is therefore possible that the anti-trust wars will see setbacks and costs for the CCC. But these should not be mistaken for terminal threats to its existence, or deep change to the dynamics of cybernetic capitalism. Early in the anti-trust resurgence, one commentator suggested that, while Big Tech might face some problems, ‘This isn’t to say that the end is near for these new giants … Just that the golden age is over. The new era for them will be normal politics, normal regulation, with California senators deep in their pockets who fight for them as hard as Texans fight for oil’.[12] This hardly conjures an inspiring prospect.

CRYPTO-REVOLUTION?

Another promise to dissolve the CCC’s power, diametrically opposed to the regulatory reforms of anti-trust policy, is the ‘crypto-revolution’.

Cryptocurrency originated in the experiments in digital money by radical anti-surveillance cypherpunks, but was not fully inaugurated until the 2008 appearance of the famous ‘White Paper’ by the mysterious, pseudonymous Satoshi Nakamoto, which proposed an ‘electronic cash system’ freed from central authority by a digitally distributed ledger known as the blockchain. Nakamoto’s White Paper led to the creation and adoption of Bitcoin, the first decentralized cryptocurrency, in 2009. Since then, it has become obvious, through a series of wild booms and busts, the proliferation of other cryptocurrencies – estimates of which vary widely, but in 2024 ranged between 10,000 and 25,000 distinct types of ‘crypto-coins’ – and an epic series of frauds, hacks and scandals, that such money functions not as a medium of exchange but as a speculative instrument. Yet through all this, the growth of cryptocurrencies has continued, and they now account for a sector of the world economy valued in 2023 at over $1 trillion.[13]

The crypto-revolution is part of wider agitation for what is known as Web 3.0 – a slogan coined in 2014 by Gavin Woods, co-founder of the cryptocurrency company Ethereum. It names a movement within startup culture and its retinue of financiers, futurists and techno-artists to remake digital networks. Web 1.0 was the non-commercial decentralized network created by internet pioneers; Web 2.0 is the commodified network dominated by Big Tech; and Web 3.0 will, its promoters claim, be a decentralized but commercial web.

This new digital capitalism will, it is claimed, operate on peer-to-peer (P2P) networks, running without a central server, and storing content on users’ computers – thus avoiding the creation of the controllable chokepoint nodes on which Web 2.0 corporations feed. Within Web 3.0 discourse, there are numerous suggestions as to how P2P will be monetized. Options include crowdsourced funding, rented metaverse properties and subscriptions to surveillance-proof social media. But a recurrent Web 3.0

theme – already present at the moment of Wood's origination of the term, and arguably the motor of the entire project – is 'crypto'.

Among broadly anti-capitalist thinkers, the dominant view of cryptocurrencies has been overwhelmingly negative. In an early, influential analysis, David Golumbia, an academic expert on the social consequences of computational thinking, set the tone by charting the practical interest of American far-right groups in Bitcoin for the purpose of funding their covert activities, as well as – more fundamentally – tracking the underpinnings of crypto-economic thought in libertarian free-market philosophies.[14] In the wake of the 2008 crash, crypto-enthusiasts expressed distrust in the stability of capitalism's financial system; but their proposed cure only aggravated the disease, adding to the speculative risk in the M–M′ phase of capital's circuit. Demonization of 'fiat currencies' (government-backed monetary systems) and plans for stateless money seemed to be an extension of a wider neoliberal aversion to government limits on the operation of markets.

Under the desired regime, millionaires would create their own currencies, funding sovereign-island utopias, while thousands of crypto scam artists took advantage of an unregulated market. But none of these visions address the ecological problem of crypto's dependency on arcane mathematical calculations powered by high-energy-use computer banks, and the oligopolistic control of such 'mining' operations. There are therefore powerful arguments for seeing the crypto-revolution as a revolution internal to capital – a new ultra-financialization; and that is exactly how it is depicted by its libertarian, free-market, anarcho-capitalist enthusiasts.

The emergence of anti-capitalist crypto activism is thus a startling development. Although representing a minority in both left and crypto-cultures, it can be seen in projects advanced by groups such as FairCoin, the Commons Stack, Coinrevolution and the Economic Space Agency (ECSA), and theoretical arguments like those of Joshua Dávila, author of *Blockchain*

Radicals: How Capitalism Ruined Crypto and How to Fix It. Some arguments for anti-capitalist crypto rest on the usefulness of unregulated currencies to movements targeted by the state, such as Wikileaks, virtual sex workers, and opponents of intellectual property laws. Important as these causes are, however, the fact that crypto's lawlessness also enables mercenary criminality and fascist organizing weakens this pragmatic case. More interesting is the theory that blockchained currencies might provide an alternative economic logic to that of capital: this is the position of a theorist who we have already cited as strongly influencing our analysis of the CCC, Jonathan Beller, who works with the ECSA collective and has written a foreword to their recent manifesto.[15]

The argument is as follows. While crypto-culture is indeed suffused with right libertarianism, this obscures a more basic fact. The capacity for people to generate their own currencies on a large scale using P2P networks creates new mechanisms of exchange completely distinct from the ones that circulate capital: money, perhaps, but a different kind of money. Examples include, not Bitcoin (generally agreed to be thoroughly capitalized), but other cryptocurrencies that issue 'tokens' based not only on commodity exchange or financial credit, but also on governance rights or environmental actions. On this basis, left cryptocurrency experiments speculate on converting financial markets into a new kind of circulation process for the allocation of social resources, divorced from, or at least not limited to, the profit imperative.

For example, the ECSA proposes a set of protocols for a fully token-based post-capitalist economy.[16] In this economy, blockchain 'money' creation is democratized: anyone can issue tokens for productive projects. These tokens specify a project's goals not only in terms of profitability, but also of 'alternative performance metrics', including measures for contribution to biospheric and social care, or support for the arts or human

rights. Resources gathered depend on how many people take a ‘stake’ in the supporting token currency.

Thus, a cryptocurrency’s ‘value’, rather than being monologically represented by price, is replaced with a polyphonic range of significations. Which social undertakings are realized depends on the uptake of the diverse tokenized currencies that support them. This, the ECSA suggests, is a strategy for social revolution. It has two stages: the ‘short put’ is ethical cryptocurrency investment within the current market; the ‘long put’ – realizable following another major crash of the financial system – is expanded adoption of such currencies in a post-capitalist economy.

Counter-capitalist crypto-theorists in some ways follow an impeccable Leninist logic, seeking capitalism’s self-destruction at its highest, most technically developed point. If in industrial capitalism this point was the assembly line, in finance capital, where would it be but in the production of derivatives? Nevertheless, in what we hope is comradely disagreement with Beller and other crypto-Marxists, we suggest that adherence to the vocabulary of markets, money and exchange (however mutated) may obscure the transformation they seek. A polity operating with universalized cryptocurrency issuance, and using a token economy, would seem to require some deep changes in ownership and control of material resources as a prerequisite to avoid a simple repetition of the familiar pyramidal patterns of finance capital. These preconditions are rarely accounted for in crypto-left manifestos.

If this issue was addressed, we suspect that the universal ‘tokenized’ selection of social projects would start to look less like any kind of market, and more like a familiar communist concept: control of the economy by a distributed, democratic planning process, with multilevel voting on socioeconomic options. This is a process in which the blockchain, though not cryptocurrencies as they now exist, might indeed play a significant role. But such a situation would seem likely to be a result, rather than a cause, of

incursions on private ownership, such as the expropriation of vital infrastructures and resources for communal control.

In the meantime, the currents of cryptofinance run strongly against communist use. Far from being used to diversify new multi-modal measures of value, the ability to tokenize a wide variety of assets is currently mainly employed to subject goods and services to capital's univocal master-measure of value: price. Hyper-abstracted financial instruments and investment opportunities, such as tokenized real estate, tokenized art and tokenized venture capital enable investors to buy and sell the underlying substrate commodity in small fractions, making it liquid, accessible and convenient for a wider range of investors. NFTs have indeed disrupted art markets, but at the price of deepening globalized inequalities in which successful millionaire artists stare up at their billionaire patrons, while both float above a world of those without art or bread.[17]

Cryptocurrencies are sometimes presented as an adversary to the CCC, waging 'blockchain wars' against 'Big Tech monopolists'.[18] The prospects for their success in any such conflict have shrunk since the scandalous implosion of Sam Bankman-Fried's FTX exchange in 2022 vindicated depictions of crypto as a gigantic Ponzi scheme. However, if the cryptocurrencies sector rebounds, a more likely outcome is its absorption by the colossi of the CCC. Though Facebook's early attempt in this direction foundered in the face of a thicket of regulatory problems, Meta, Apple, Microsoft, Amazon and Google have adopted piecemeal blockchain projects into their own operations, and they include cryptocurrencies in their huge investment portfolios.[19]

This oligopolistic introjection of crypto-economics is paralleled at a state level by the development of Central Bank Digital Currencies, while private crypto exchanges fall under the same regulatory government scrutiny that is now levelled at the CCC.[20] All of this seems to validate Richard Wolff's verdict on the crypto revolution – that while 'the advent of blockchain

technology … could be a way to achieve a genuine democratic control over the means of production … [it] will be subordinated and the parts that fit that capitalist structure will be kept, but the parts that challenge [it] will be discarded'.[21]

ANTI-CAPITALIST ANTI-CYBERNETICS

If neither anti-trust policy nor crypto-design undermine the CCC, is there a third revolutionary option: disconnection from cybercirculation? The internet has been widely and persistently criticized for its corrupting effect on literacy, attention and sociality. As in other moral panics, these anxieties often focus on the young. Children's and adolescents' screen time is a major topic. From the 2000s onwards, such concerns have only been heightened, now allying concerns about screen addiction and toxic social polarization to critiques of corporate profit-seeking. This link is underlined by the regular emergence from CCC corner offices of contrite whistle-blowers confessing involvement in the algorithmic manipulation of vulnerable groups.

Since the first '#delete Facebook' campaign in 2018 – part of the fallout from the Cambridge Analytica scandal – the meme of 'disconnection', either from specific platforms or from networks as a whole, has burgeoned. There is now a thriving line in studies of disconnection that explore the motives for disengagement from network compulsions; the false escapes and opt-outs proffered from within the system; the way the logic of digital divides is inversely recapitulated in disconnection issues, with the self-optimizing network 'detox' of the affluent professionals being unthinkable for the digitally monitored gig worker or welfare recipient; and the ways in which the CCC has now colonized the avenues of escape with usage monitoring, time-management apps and self-help videos.[22]

We limit our discussion here to disconnection projects explicitly linked to anti-capitalist perspectives. In 2001, as the tide of alter-globalism was

ebbing and the dot-com boom was collapsing, the anarchist collective Tiqqun published *The Cybernetic Hypothesis*. It was both a critique of digital capitalism and a rejection of cyberleftism. Tiqqun argues that capitalism has passed into a cybernetic phase in which information and communication systems are new modes of biopolitical governance. Individuals are subjected to constant surveillance and control, their desires and behaviours monitored and manipulated. Instead of '[reappropriating] the most modern technological tools … by creating a counter-world with the same means that it uses', Tiqqun contends, '*The important thing is maybe to create vacuoles of non-communication, interrupters who escape control* [and] to have opacity zones, opening cavities, empty intervals, *black blocs* within the cybernetic matrix of power.'[23] This argument was clearly aimed at alter-globalism's cybernetic turn, with its network of information centres and 'electronic fabric of struggle'. It started a prolonged debate about the place of the digital in anti-capitalist struggle.

In 2011, another anarchist group, associated with Tiqqun, the Invisible Committee, proposed the sabotage of logistical systems like high-speed train systems and electronic networks. Their position was criticized by the Marxist philosopher Alberto Toscano for lacking any perspective on how such systems could be reconfigured in a post-capitalist future.[24] This in turn elicited a rejoinder from Jasper Bernes, an activist in the Occupy blockade of the Port of Oakland, who posited that logistical infrastructure such as high-tech ports was designed for the 'high-volume and hyper-global distribution' of commodities that revolutionary anti-capitalism should eliminate. Reconfiguring such systems would also be impossible for regional social revolutions that have to make do with local resources. Invocations of the 'deus ex machina of supercomputers' to establish a new social order were therefore pointless.[25] Though initially centred on logistics, this debate engages questions relevant to the whole of the CCC, and to the prospects of disconnecting from it.

Anti-cybernetic anti-capitalism germinated in insurrectionary anarchism, but has more academic iterations; theorists like Alexander Galloway, Eugene Thacker and McKenzie Wark have elaborated on issues raised by the likes of Tiqqun and the Invisible Committee.[26] But it is James Crary's *Scorched Earth: Beyond the Digital Age to a Post-Capitalist World* that most recently and uncompromisingly rearticulates *The Cybernetic Hypothesis* for the age of Google and Facebook.

Crary criticizes 'the internet complex' that has 'become inseparable from the immense, incalculable scope of 24/7 capitalism'. The corporate direction of AI, 5G networks and the Internet of Things are generating a planetary worksite, remaking individuals into 'entrepreneurs of their human capital'. It is also remaking, Crary argues, the basic sensory components of human existence itself, so that computerized speech and networked bots are producing a 'mechanization of emotion'.[27] More profoundly still, the internet complex destroys any deep sense of time, fostering a sense of 'immediate availability' to bolster habits of instantaneous consumption 'unmoored from spatial, material, or temporal constraints'.[28] The digitally intensified cycle of capitalist production, circulation and consumption is, Crary writes, generating a 'scorched earth' that is creeping towards irreversible ecological crisis. The only way out is through a refusal of digital technology: 'If there is to be a livable and shared future on our planet, it will be a future offline, uncoupled from the world-destroying systems and operations of 24/7 capitalism.'[29]

While 'we may abstractly deplore the millions of lives and species rendered disposable by capitalism or the devastation of ecosystems on which we depend', this sentiment is useless as long as we 'cling to our disembodied online routines and to the illusion that the internet complex is somehow not a primary agent of the catastrophe'.[30] Thus, while one meaning of Crary's 'scorched earth' refers to capitalism's destruction of the

planet, another denotes the ‘scorched earth’ tactic of destroying, or at least abandoning, our own digital devices and habits.

We share critical ground with these theorists of digital refusal. Their analysis of cybernetic capitalism is broadly similar to ours: Crary’s ‘internet complex’ is akin to our CCC. Even in the early days of digital optimism, anti-cybernetics anarchists identified real dangers in the radical political use of networks that are now much more widely appreciated – and the emergence of cyberfascisms confirms their worst apprehensions about the direction of networked capital. Yet we part company with absolute digital rejectionism on both pragmatic and theoretical grounds.

There is an unavoidable performative contradiction in the work of anti-digital theorists whose writings circulate online, and who depend on the internet for most of their reception. We are not raising this as a cheap debating point, but rather as an observation about struggles that are at once ‘in and against’ digital capitalism. Successive waves of anti-capitalist activism, while becoming more aware of the dangers and problems around digital systems, continue to use them, developing and adopting workarounds, countermeasures and hacks. Such movements act in conditions ‘not of their own choosing’.[31] They do not enjoy the luxury of purity, not even the purity of digital abstinence, but must make their way across a terrain where the social has already been largely dissolved into the digital. Everyone hates the internet, and everyone uses it.[32]

Arguments for revolutionary disconnection rest on the idea that technologies, rather than being intrinsically progressive, or even neutral, are shaped by the logic of the societies that create them. Hence cybernetic networks, created by capital, are pre-implanted with capitalist values. The idea of social determination is important. However, social systems such as capitalism contain internal contradictions, and these play a part in making technologies – a process that is not dictated solely by the goals and aspirations of owners and designers, but also influenced by the social

pressures to which they respond. Technical systems bear the mark not only of what they are made for, but of what they are made to avoid or escape.

This is apparent in the history of the internet. Capital resorted to cybernetic automation and electronic supply chains because workers' wage demands and strikes against factory exploitation forced it to seek ways of escaping industrial conflict. The adaptation and uptake of digital networks reflected not only vast opportunities for profit, but also decades of dissatisfaction on the part of alternative media activists, artists and thinkers with old media oligopolies and their top-down communication systems. The CCC – with its advertising-and-surveillance social media and free search services – emerged because dot-com capitalism's digital storefront model was rejected by users unwilling to pay for content they had been circulating for free.

Capital's response to these pressures was perverse, making the internet ugly and toxic. Yet the trace of popular and radical desires is nonetheless etched into network design, in the very protocols that enable worldwide, real-time, many-to-many communication between billions of people. The future direction of cybernetic systems will itself be socially determined – which, for us, means determined in struggle. Capital is ascendant and exerts an asymmetrical power over networks. Nonetheless, the process of the internet's creation has, as Rodrigo Nunes puts it, created 'affordances' – possibilities of use – that exceed and outrun total corporate control, and cannot be exclusively captured by cyberfascism.[33] To recognize this is not to embrace every technological intensification indiscriminately, but neither does it recommend complete network rejectionism. Rather, it points to digital struggles that 'must necessarily be extended to the architecture and ownership structure of the internet: the fight over these is a fight over the terrain in which struggle takes place'.[34] It is with this in mind that we turn to examine socialist cybernetics.

The CCC propels the out-of-control cybernetic commodification of a burning planet. Anti-trust regulation is an ineffective placebo. Crypto-revolutions are pseudo-revolutions. Disconnection is understandable but self-defeating. There is another option: remaking the digital as part of a society beyond capitalism. The creation of such a society has been the historical goal of socialist and communist movements. This is no place to detail the many forms these movements have taken – their internal disputes, intermittent victories, and many defeats.[35] Suffice it to say that socialist ideas for a post-capitalist society usually include the wholesale or partial replacement of the market with a planned allocation of resources, guaranteeing basic life necessities for all and radically equalizing social and economic conditions to dissolve class divisions.

To consider a revolutionary, post-capitalist remaking of digital networks is therefore to consider only one dimension of a broad transformation – but it might be a very important dimension. In many ways, the internet seems like a crucial resource for a socialist society. After all, if one is building a new system of collective resource allocation, what could be more useful than an apparatus for rapid, real-time, many-to-many global communication and conversation?

From the early days of computerization, some socialists recognized this potential. If the market was to be replaced by a planned allocation of resources, this required some substitute for the millions of atomized decisions of production, sale and purchase made in the process of commodity circulation. Free market economists such as Ludwig von Mises declared this ‘calculation problem’ insoluble, and condemned socialism to failure.[36] Friedrich Hayek went further, arguing that the market already operated like a telecommunications network, emitting price signals that set in motion feedback loops of bargaining between buyers and sellers, which eventually ensured the best possible economic outcome.[37] Yet some

socialist economists saw that this argument was potentially reversible.[38] If the totality of market processes in a sense computed the economic inputs and outputs of capitalist societies, why not substitute real computers to do the same job, operating not according to profit-driven price signals, but as part of a planning process for a fairer society?

Such ideas were never put into practice. Computers and digital networks developed first and fastest in the capitalist world, contributing to the US victory in the Cold War. Its state-socialist opponent had eminent computer scientists, but they were stifled by its authoritarianism. From the 1960s, Soviet cyberneticists made repeated attempts to improve a ramshackle planning apparatus with networked computing, only to have their efforts squashed by bureaucrats.[39] In 1970s Chile, the socialist government of Salvador Allende, assisted by maverick British cyberneticist Stafford Beer, experimented with computerized planning; but the project died when Allende was overthrown by a CIA-backed right-wing military coup in 1973. The history of socialist cybernetics is thus largely one of failure.[40]

Yet, in the early twenty-first century, as capitalism slides into successive financial crises, dizzying inequality and ecological ruination, there has been a revival of interest in post-capitalist networks.[41] Even at the height of an apparent free-market victory, economists Paul Cockshott and Allin Cottrell continued to explore how exponential increases in computing power made cybernetic planning easier.[42] Following the financial crash in 2008, there was a wave of renewed interest in this possibility.[43] The growing power and problems of the CCC have provided another point of entry for socialist critique of capitalist computing. Vincent Mosco has proposed a ‘public utilities’ internet, in which networks are understood as a basic social service – like water or electricity – administered either by highly regulated companies or new forms of public authority.[44] Ursula Huws has advanced an agenda for a ‘digital welfare state’ that would repurpose online platform technologies, bringing them under public control.[45] Rob Larson and Ben

Tarnoff have similarly advocated a reversal of the privatizing dynamic that transformed the internet into the CCC, returning to the treatment of networks as a public resource rather than a profit-driven platform.[46]

Other strands of cybernetic socialism have emerged from traditions that emphasize the need for the control of workers over production. The call to 'abolish Silicon Valley' by former digital entrepreneur Wendy Liu envisages a reconfiguration of startup culture through collective ownership by technology workers.[47] A broadly similar direction is taken by the 'platform cooperative' movement to convert digital platforms into worker-owned enterprises – a project that has shown some practical successes, particularly around platforms organizing gig-economy labour.[48] James Muldoon's 'platform socialism' sees worker and community ownership of platforms expanding into federated structures governing network activities at successively wider levels of public control.[49]

Some fragments of these socialist cybernetics found their way into election-orientated left-populist movements, like those of Bernie Sanders's 2016 bid for the Democratic presidential nomination, Jeremy Corbyn's Labour Party and Jean-Luc Mélenchon's La France Insoumise. These have variously included calls for the imposition of anti-trust restrictions on digital oligopolists, improved protection of gig workers, support of various forms of digital cooperatives, expansion of digital access, and even the creation of publicly owned social media enterprises.[50] Radical municipalism has taken effect in cities including Barcelona and Amsterdam, where broadly left-wing regional governments have adopted policies to use data as a public planning resource. In North America, Seattle has attempted to create alternatives to Uber and Lyft, and Toronto and Brooklyn rejected attempts by Google and Amazon to take control of urban planning. These successes are important, but also evidently a long way from a revolutionary reappropriation of the CCC.[51]

Unsurprisingly, there are disagreements among digital socialists and differences in their plans for post-capitalist networks.[52] Central planning has a long and sometimes disastrous history, and many on the anarchist and autonomist left are allergic to its revival in the digital sphere. Even more modest plans of government-run networks with careful safeguards – such as Mosco's 'public utilities' model – arouse fears of state-socialist data surveillance. A contrasting vision of post-capitalist networks revolves around P2P networks that do not rely on centralized servers, but instead disperse all of their content among the computers of their users. However, many P2P advocates prefer to avoid the term 'socialism', and instead speak of the digital 'commons', harking back to pre-capitalist sharing traditions for models of collective resource allocation that depend on neither market prices nor state control.

The major champion of this position is Michel Bauwens, the founder of the P2P Foundation – a forum for left-libertarian thought on digital networks. He has a fully articulated plan for a post-capitalist transition to a society based on a combination of cooperatives and P2P production.[53] This is conceived as analogous to the transition from feudalism to capitalism. However, Graham Murdock, a professor of the political economy of the media, has strongly criticized Bauwens and his colleagues for failing to take account of the pivotal role played by states in creating and sustaining communications infrastructures, and shaping their purposes for public or private interests.[54] This point seems especially important given that P2P networks have proved eminently adaptable to neo-fascist uses, and have been designed and championed by far-right thinkers such as Curtis Yarvin, programmer of the elaborate decentralized system Urbit.[55] These disagreements between 'nationalize Google' socialism and the P2P commons are not insurmountable antagonisms: Bauwens admits the importance to a growing P2P network of a 'partner state'; while a more

hard-line Marxist, Christian Fuchs, conceives of a public-utilities network organized as a ‘commonstopia’, rather than as a direct organ of the state.[56]

Another, more fundamental divergence in socialist discussions of the digital realm concerns the relation of technology to ecology. In general, leftist enthusiasm for cybernetic planning embraces those elements in Marx’s thinking that see socialism as enabled by and expanding the ‘forces of production’ – especially new technologies – nurtured by capitalism. The most exuberant expressions of this position take the form of a left ‘accelerationism’, typified by Aaron Bastani’s call for ‘fully automated luxury communism’.[57] Digital socialism is thus often aligned with an ecomodernist position, in which the solution to ecological crises is found by technological means – for example, addressing climate crises not only through solar and wind technologies, but potentially nuclear energy, carbon capture, and perhaps even geoengineering, without any interruption to economic growth. Proponents of cybernetic socialism – such as Leigh Phillips, who argues that the digitalized inventory systems and computer-run supply chains of Walmart provide a ready-made post-capitalist planning infrastructure – are also fiercely critical of any suggestion of ‘green austerity’, which Phillips sees as extending neoliberal attacks on the living standards of the North American working class.[58]

This contrasts with a contrary eco-socialism contending that any post-capitalist society will have to dispense with previous assumptions about technological advancement and economic growth. A wave of interest in ‘degrowth Marxism’ has been supported by suggestions that Marx, in his later work and in his unpublished notebooks, arrived at a far greater scepticism towards the notion of progress.[59] Discussions about the social planning required for an eco-socialist degrowth have proliferated, but most do not directly address the place – if any – of networks in this process.[60] One striking exception, however, is Troy Vettese’s and Drew Pendergrass’s *Half-Earth Socialism*, which hypothesizes a socialism based on rewilding

50 per cent of the planet, and a cybernetically planned economy to organize the other, human-populated half.[61] Another important contribution is the work of Michael Kwet, whose critique of digital colonialism and the Western limits of anti-trust reformism is explicitly tied to an eco-socialist degrowth agenda.[62] It looks to the international dissolution of intellectual property laws that consolidate US corporations' dominance of the digital economy, and to redistributive reparations to the Global South that include strengthened, socialized digital capacities.

These debates have shaped our vision about what might replace the CCC. We think that accelerationist cybernetics are being overtaken by the even faster acceleration of climate change and other biocrises, which demand serious consideration of a digital degrowth programme – and this will require both vertical and horizontal institutions. Rather than schematically reviewing these controversies, we will engage them in proposing, if only as a spur to discussion and imagination, another vision of post-capitalist revolution – one we term biocommunism.

BIOCOMMUNIST CIRCULATIONS

In her book *Thinking in an Emergency*, Elaine Scarry considers the role of habit in our ability to bring about the end of an emergency. She cites cardio-pulmonary resuscitation (CPR) training and simulated emergency responses as examples of habituation that allow for life-saving deliberation. For Scarry, these practices of care are maintained and enacted through feedback systems. Against the temptation to associate the habitual with 'the suspension of thought', Scarry argues that habit advances neuronal plasticity. That is, habit helps us to *continue* thinking even when we are tempted to abandon thought (as we often are when confronted with a crisis). Moreover, Scarry underscores the role of 'civic and moral engineering' in emergency measures like the Quills Plain mutual-aid contract in Canada,

which combines local authorities and volunteers in emergency decision-making, and the Swiss shelter system, which exists primarily to ensure civilians' safety in the event of nuclear war.[63]

Both systems emphasize the commitment to 'equality of survival', which extends to all inhabitants regardless of their citizenship.[64] This impulse has also been cultivated in Japan where, Scarry writes, '1.4 million people are trained in CPR every year'.[65] As a result of continued training, the survival rate for cardiac arrest in the city of Osaka increased from 5 per cent to 12 per cent – a proportion that contrasts starkly with the 1 per cent survival rate in New York, Chicago and Los Angeles.[66] Endowing citizens with moral responsibility and necessary knowledge has quite literally formed collective life-saving habits. As social movements increasingly rely on digital infrastructure, how might we rethink the value of cybernetics in democratic decision-making?

What form of communism could emerge from our age of catastrophes, with its overlapping economic, ecological, epidemiological and political crises arrayed around the massive central dynamic of climate change?[67] We envisage a biocommunism, an 'ecqualogical' social system that could navigate the double imperative of ecological sustainability and equalized social development. In its twofold articulation of environmental and social goals, biocommunism would resemble the new world systems some green theorists have imagined; but, unlike most such proposals, it would be uncompromisingly red in directly appropriating from capital the power to direct the allocation of resources. It would revoke the patriarchal, colonial legacy of a will to techno-scientific growth that is, as eco-socialist and eco-feminist Stefania Barca has pointed out, deeply implicated in forms of 'frontierism'. Its logic of equality and ecology would combine elements of both social levelling – equalizing conditions of life around the world – and degrowth – checking capitalism's compulsive drive to expand its commodity throughputs.

Imagine – it is not very hard – a world in which mounting disasters of fire, flood, drought and disease place measures on the political horizon that would previously have been considered extreme. These might include not only immediate closure of oil companies and other agencies of fossil capitalism, but also restrictions on the energy consumption of the wealthy – a major driver of greenhouse-gas emissions. Banning private jets and superyachts would just be a start. Conversely, demands for social support for millions of proletarians struggling to survive and adapt – climate refugees, heatwave workers, households crumbling under escalating costs of living – would become irresistible. Maintenance of vital security systems and emergency relief, such as medical, firefighting, food supply and rescue services, would be a pressing social priority.[68]

In biocommunism, resource allocation would take place through democratic collective planning.[69] And computers and networks would play a part in this. This cybernetic component would not just be a matter of adding energy-saving devices – smart homes or smart grids – to existing capitalist market relations. It would also involve mobilizing mass governmental and intergovernmental projects and local, community projects to electrify production, speed up the introduction of renewables, and adopt strategies of disaster mitigation and adaptation. But, above and beyond this, it would also require the colossal planning tasks involved in determining what types and levels of energy use – and hence economic activity – were compatible with an ecologically viable society, and what consumption norms would be required to share this responsibility equally on a global basis. This would be a ‘calculation problem’ demanding the data-gathering and computerized projection and assessment that socialist cyberneticists envisaged supplanting market forces – directed, however, not at accelerating growth, but at containing it within humanly liveable biospheric boundaries.

Its form of cybernetic circulation would differ from those of the capitalist CCC in several ways. Firstly, the mechanism for circulation would not be market price signals, but collective, democratic decisions about the conditions of social reproduction, not unlike the ‘equality of survival’ embedded in the Quills Plain contract and the Swiss shelter system. Nor would the apparatus for such planning be privately owned, profit-driven enterprises, but a complex social infrastructure of public utilities, cooperative or worker-run workplaces, and communal organizations. Experimentation in municipal and digital infrastructure is gaining strength around the world; the many digitally coordinated mutual-aid initiatives that sprung up during the pandemic and other natural disasters also prefigure biocommunist changes in the social fabric.

The crucial feedback processes – or decision-making loop – would provide an exchange of information, a stream of social intercourse, about the success, failure or inadequacies of the planning process. These feedback processes have been intrinsic to commons-based web initiatives, from open-source software design to Wikipedia, and they continue to be a resource for community experimentation stripped of capitalist co-option. A biocommunist system would be capable of both intentional growth and contraction of economic activities. It would not be characterized by the runaway positive-feedback loop of profit-propelled growth (and its associated overshoot crashing). Writing on China’s grain shelters in the Qing period, Scarry notes, ‘Distribution itself was recognized as “an art,” and alternative forms of distribution were developed for lean, fertile, and normal production harvest[s].’[70] Such practices reveal the possibilities inherent in communal approaches to social reproduction.

The circulation process of biocommunism would be geared towards attaining what environmentalists refer to as a ‘circular’ economy, in which reuse and regeneration of materials becomes central to continuing production in a sustainable way. We see potential for these changes

emerging in many ways: in movements for agro-ecological sustainability practices; in the success of feeding home-generated renewable electricity into the grid; in struggles and movements for reuse and repurposing of materials. But these need to be freed from their constraint by and subordination to a market logic.

While such a system would draw on cyberphysical technologies – that is, computers and networks – it would also necessarily monitor the ecological and social consequences of these technological apparatuses, and self-reflexively adjust its scope accordingly. The rich traditions of ‘citizen science’ anticipate the changes necessary to remove such oversight from corporate-captured regulatory institutions, making them an intrinsic part of democratic culture.

Such planning would not supply the highly variegated consumerism characteristic of advanced capitalist economies. It would have different goals: environmental plenitude, free time, social solidarity and species survival. Combining ecological and equalitarian constraints together favours provision of a common ‘basket of goods’, guaranteeing food, medical care, housing, education and public transport as free, universal services, alongside observance of the principles of public luxury and private sufficiency, with a subordinated market sector supplying a reduced range of consumer items. This could be seen as a system of planetary ‘rationing’ – providing we remember that the so-called free market is also a system of rationing by price. What biocommunism would provide instead would be universal provisioning: that is, a guarantee of an ecologically moderated standard of living.

The other side of this expectation would be that everyone who is capable would be required to contribute to the work of emergency care and ecological restoration; climate-crisis remediation and other forms of ecological repair would entail all kinds of work. As Cory Doctorow has written, this would involve ‘relocating every coastal city in the world

kilometers inland, building high-speed rail links to replace aviation links, caring for hundreds of millions of traumatized, displaced people, and treating runaway [zoonotic] and [insect-borne] pandemics'.[71] The planning of social labour would not include only the allocation of onerous or emergency tasks (although that would be important), but also the longer-term development of vocations and expertise in work stabilizing and enriching the planetary biosphere and human habitat.

Our plan, then, is for a digital degrowth. The synthesis of these two apparently opposed terms, 'digital' (a repurposing of high technology) and 'degrowth' (naming radical ecological action) is integral to biocommunism. As we have seen, what is generally referred to as 'eco-socialism' has recently exploded into two hostile camps. Eco-modernist Marxisms champion massive publicly owned techno-projects of nuclear power, carbon capture and even geoengineering as the proper responses to climate crisis, while degrowth eco-socialists too easily sound like, and perhaps sometimes are, advocates for reversion to imaginary, low-tech rural utopias. Exchanges between these two factions are often rancorous.

Biocommunism is transversal to this eco-socialist schism. We think much of this pro- and anti-tech dispute is predicated on a false dichotomy. Any degrowth project that is not an outright primitivism will have some technologically innovative aspects – notably, transition to the renewable energy resources of solar, wind and thermal power. But it is also evident that, given the increasing pace of the climate crisis, many of the projects on which techno-accelerationist Marxists pin their hopes will arrive – if at all – far too late to avert major climate chaos; will likely not work as well as hoped; and, if introduced in the context of unconstrained economic growth, may indeed precipitate eco-crises as severe as those they aim prevent (for example, through nuclear accidents and waste, deep-sea mining of rare minerals, or geoengineering failures). Any solution to biospheric crisis will require both a change in social patterns of production and consumption and

new technological infrastructures. Biocommunism is a project that, in classic Marxist terms, reworks both the ‘relations’ and ‘forces’ of production and circulation, subordinating the pro- and anti-tech question to the double imperatives of species survival and social equalization.

Biocommunism would mean less of some things and more of others: degrowing carbon industries to the point of termination; growing renewable energy sources; degrowing high-intensity consumption in the Global North while improving living standards in the Global South; more bandwidth for planning global energy flows, less for the planetary selfie-tsunami. It would not discount possible technological solutions to the climate emergency and other ecological crises; research into scientific possibilities like fusion energy, super-conductivity and hydrogen economies would be part of its planning. However, it is now evident that such innovations, even if at all plausible, are too far from realization to respond in time to the rapid escalation of global boiling. Moreover, many techno-fixes – especially if introduced within the logic of the world market – are themselves biohazards. A runaway green capitalism, based on unconstrained mining of the rare-earth minerals essential to renewable electrification, and sanctioned by the dubious certification of ‘clean’ energy, could produce its own form of biodiversity-destroying eco-disaster. Biocommunist measures would therefore involve changes in social relations.

We find the general form of the planning system for biocommunism in the architectures for distributed cybernetic planning proposed by Aurora Apolito and others.[72] Cédric Durand, Elena Hofferberth and Matthias Schmelzer propose ‘a fractal architecture of multilevel ecological planning beyond growth’ based on what they term a ‘planning stack’.[73] This involves multilevel interactions up and down a laddered social organization connecting governmental ‘design and deployment’ agencies, tasked with the setting of ‘broad targets’, and the devising of policy macro-tools, with ‘territorial and sector’ organizations conducting experimental application of

the plan in specific industries and localities, with a further tier of ‘city councils, enterprises and other autonomous organizations’. Each of these levels would be subject to ‘pluralistic inputs’ from ‘citizens, scientists, industrial bodies, social movements, public agencies and government bodies’. The authors are vague about the context in which such a ‘planning stack’ would work. In our view, its effective operation would depend entirely on how far it was empowered to supersede the market allocation of resources with democratic decision-making – in other words, on its being a revolutionary institution.

A planning stack would be a core institution of biocommunism, but the ‘basket of goods’ it would provide should include guaranteed access to an independent system of free nets: user-managed peer-to-peer networks. These networks would strip away the synthesis of micro-targeted ads and ubiquitous surveillance that drives so much of capital’s CCC. Instead of being administered through the centralized servers of capitalist oligopolies or state authorities, they would be based on P2P principles, by which content is stored only on users’ computers and made accessible to other members, followers or friends, and in which issues of moderation and design are determined by the user-communities.

There would be tension between the vertical domains of the planner stack and the open, horizontalist logic of the free nets: one can envisage intense and widespread criticism of the planning process, and important contributions to it, fomenting on the free nets. Despite the problems P2P poses to any regulatory system, we agree with Derek Hrynyshyn’s vigorous argument for the importance to any form of networked socialism of a zone governed by free speech – and free innovation – relatively unpoliced, apart from provisions to prevent serious crimes.[74] The migration of users from Musk’s chaotic and toxic X to the federated, advertising-free and largely self-managed platform envisioned by Mastodon suggests a widespread interest in altered forms of social media.[75] The formation of surveillance-

free networks outside the cybernetic planning process will, given current technological capacities, happen by itself. We believe this is a process that any contemporary communism should actively encourage, as a feature rather than a bug: an immunization against the despotic tendencies of state planning, and one that works by universalizing the right to relatively un-surveilled discourse, rather than making it the domain of neo-fascisms backed by billionaire-class dark money.

In one sense, then, the cybernetic aspects of biocommunism would be a re-coding of capitalism's CCC under new, non-capitalist management. Google would become a data collection and processing agency of the planning stack; Amazon fulfilment centres would dispatch emergency deliveries of the global basket of goods that cannot be locally produced; Uber and Lyft would be converted into public-transport facilities; Apple would host apps for communist work brigades; Facebook, TikTok and the platform formerly known as Twitter would be converted into advertising- and surveillance-free zones; Microsoft's data centres and AIs would be appropriated to redistribute global wealth to the waged and unwaged workers who created them. We could even imagine a 'reverse Palantir': a digital platform whose task would be to welcome, assist and provision – rather than expel – climate refugees.

But there is a twist. Biocommunism would establish biospheric limits to energy use and environmental destruction, and it would apply these limits to its own cybernetic circulation apparatus. Its planning would include ensuring that the digital mapping of global resources did not destroy the territory it was intended to conserve. A cybernetic 'planning stack' capable of degrowing parts of the capitalist economy would inscribe on itself the imperatives of rationing, selection and prioritization – a self-denying ordinance. Computer processing power and communicational bandwidth would be understood as finite resources dependent on material inputs, such

as the metals, minerals and water required in semiconductor manufacture and the electrical energy powering data centres.

Biocommunism would thus be neither a high-tech utopia nor a primitivist dystopia, but a complex society with its own internal paradoxes, torsions and contradictions. It would create a digital domain that, while expanding in some directions, would retreat in others. It would be unlikely to develop a totalizing, all-consuming metaverse of virtual realities, to which humans would migrate from a planet devastated by the real abstractions of capitalism. Biocommunism would, as part of its regime of ecosystemic care, save humans from exhaustion. People would have more free time than they do today. Following Fredric Jameson's iconoclastic suggestion for a socialist 'army of labour', we imagine a four-hour workday of mandatory planet-preserving labour, with the remaining time free for people to pursue their own interests.[76] Biocommunism could be the world of 'alternative hedonism' envisaged by Kate Soper in her discussion of the different forms of consumption that might emerge in a post-growth society – perhaps enlivened with a dash of the 'acid communism' espoused by Mark Fisher, and imbued with a collective responsibility enacted through the mutual-aid practices examined by Scarry.[77] So there might well be less screen time.

For a visual symbol of biocommunist circulatory communication, we nominate the 'pink cell tower' by the 'critical engineer' and eco-activist Julian Oliver. The installation features a fully functional mobile-phone antenna whose luminous, hot coloration repudiates the dull, secretive camouflage colours of corporate equipment in favour of the full public visibility of 'extroverted infrastructure'.[78] The solar-energy-powered tower 'accepts connections from any mobile phone, [allowing users] to text and call others connected to the network for free, and entirely in private'. The instructions for rebuilding the Pink Cell Tower are made available over its network. The tower also randomly selects nearby devices and treats them to

Stevie Wonder's 'I Just Called to Say I Love You'. Perhaps a little more extroverted than some would like, but we appreciate the spirit.

TUMULT

Revolutions come from turmoil: the creation of a biocommunism, or any other eco-socialist system, will be conflictual. It will arise from the composite connections of various nodes of struggle – anti-capitalist, ecological, feminist and decolonizing – in new forms of organization, capable of moving transversally between 'vertical' and 'horizontal' options.[79] Biocommunism fights on a triple front: against the far right and its harnessing of climate denial, anti-vaccine sentiment, and conspiracy arcana; against a repressive digital state apparatus that seizes on the reality of neo-fascist insurrection to expand its repressive powers for maintaining the status quo; and for the organization of gig-economy workers and network users against the exploitation of digital capital. Merely 'breaking up Big Tech' better to enable new and nimbler digital capitalisms cannot answer to its demand – and nor can blockchain dreams of crypto-financialized Web 3.0. The latent logic that connects scores of experiments in platform cooperatives, P2P and micromesh networks animates the stripping out from the digital system of the commodity vectors that make the networks essential to maintaining a life of ultra-consumerism, thereby dismantling capital's cybernetic circulatory apparatus, and converting it into a 'vast association' of public utilities and mutual aid, supporting survival in the midst of ecological and social emergency.[80]

The establishment of a biopolitical planning stack will be opposed both by corporations and by the far right. Its efficacy will depend on a decapitation of capital and the defeat of neo-fascism. Planning will be both the stake and the table over which this game is played. Its establishment will therefore be more tumultuous and ramshackle than the futures

envisaged in many utopian prefigurative models of post-capitalist society. Sections of the planning stack will constantly be collapsing because of inexperience or sabotage. As digital technologies make their own damaging demand on natural resources, popular planning will wrestle with the ecological demands of its own apparatus. Planners will have to factor in interaction with galaxies of free, user-managed P2P networks subject to only minimal regulation and learn to live with, and even appreciate, the inevitable tension between the two domains. Nonetheless, a reconfigured biocommunist apparatus of communication, cooperation and coordination can transform circulation into revolution.

CODA

Lifeblood

Circulation is a biological term. Political economists like Adam Smith and Karl Marx imported it from medical science, where since the seventeenth century it referred to the recently discovered circulatory flow of blood around the body, and applied it to the processes of capital. In examining the CCC, we consider capital as a social organism whose lifeblood – the ceaseless passage of money into commodities and back again to money – is now made of digital flows. The question of whether digital systems might ever attain life-like properties has always lain in the background of the historical discipline of cybernetics, ever since Nobert Wiener fatefully defined it as the study of 'control and communication in the animal and the machine', thereby suggesting an affinity, or even equivalence, between biological and technological entities.[1] Behind the CCC's intense research into artificial intelligence has been an unconcealed ambition to create not just new technology, but a new form of life, one with unprecedented powers. This dream of 'the singularity' is now a world-cultural motif, informing thousands of fictions, films and fantastical imaginings of all types about a moment when tools 'come alive' and automation passes into animation.

Such a prospect seems an unlikely topic for a Marxist analysis. But Marx wrote extensively about 'alienation', particularly in his youthful works, as well as in later texts such as *Grundrisse* and *Capital*. There, his concern was not extraterrestrial aliens, but the alienation of workers by capitalism – that is to say, the way capital usurped people's control over

what they made, how they made it, their relations with other people, and ultimately their 'species being': human nature itself. He even referred to capital as an 'alien power'.[2] The apparent correspondence of these references with current conversations about UFOs and entities from other galaxies is something of a linguistic illusion: Marx wrote in German, and his term for alienation, *Entfremden*, 'is only equivalent to "alienate" in *one* sense of the English word – in the sense in which we speak of two people being "alienated," or of someone's affections being "alienated."'[3] It has no etymological relation to the English sense of an alien as an extraterrestrial. Yet there is a sense in which the topic of alienation, with all its eerie connotations in English, imbues the issue of AI as a powerful technology that some consider 'alive'.

PANIC STATIONS

On 30 November 2022, this issue was abruptly highlighted when the US research foundation OpenAI released ChatGPT 3.5 (Chat Generative Pre-trained Transformer) – one of a family of AIs known as Large Language Models (LLMs), trained on vast amounts of text data scraped from the internet that enable it to comprehend and participate in complex linguistic interactions with humans. The bot could converse with users, answer questions, and undertake tasks such as writing essays, summaries, translations and computer programs, refining its responses to prompts over successive iterations. It was rapidly apparent that ChatGPT 3.5 could, upon request, generate text of a standard roughly equivalent to run-of-the-mill corporate reports or C-grade undergraduate essays. It displayed moments of startling acuity, but also frequently 'hallucinated' false information.

By January 2023, ChatGPT 3.5 became what was to date the fastest-growing consumer software application in history, gaining over 100 million users in a month. It threw the CCC into turmoil.[4] A program that could

directly answer user questions, and expand answers into text, had the potential to replace search engines as the preferred way for internet users to gather information. This would undermine the tying of web-based advertising to search results that funded Google, a titan of the digital industry. OpenAI had started as a non-profit organization, but from 2019 was funded by and partnered with Microsoft. ChatGPT thus placed a potentially mortal weapon in the hands of one of Google's corporate rivals. Google rushed out a competing conversational chatbot, Bard, even though its engineers had warned that the program responded to queries like a 'pathological liar'. When Bard incorrectly answered a question about the James Webb Space Telescope Alphabet in a live demonstration, Google immediately lost $100 billion from the value of its shares.

In general, however, Big Tech stocks rose vigorously in 2023, recovering from their 2022 slump, and signalling the real meaning of AI to digital capitalism: profit. The economic implications of ChatGPT extended beyond dethroning Google Search. Even if Google successfully doctored Bard or some other chatbot, direct answers to user queries would upset the entire ecology of networked advertising that underpins many aspects of the CCC's current organization. Whoever successfully commercialized LLM AI could dominate whatever new system emerged. Rivals of Microsoft and Google resorted to desperate measures. Zuckerberg announced that Meta would make its own Large Language Model AI, LLaMA, generally available.[5] This apparently public-spirited move was certainly driven by corporate calculation, aiming to ensure that Meta, not its competitors, establish the standards and norms for LLM chatbots.

Meta's move intensified the market tumult. An anonymous Google software engineer wrote a memo to management titled 'There is No Moat', describing an avalanche of popular AI experimentation immediately following LLaMa's release.[6] Grassroots innovation was moving so fast, the author wrote, that it was now possible to tweak and fine-tune a text

generator on a laptop in a few hours. Neither Google nor Microsoft was in a position to control LLM production, which had become irreversibly distributed. It might seem that this would mark the end of profiting from chatbots. But this was not the conclusion of 'There is no Moat'. Rather, 'the one clear winner in all of this is Meta': 'Because the leaked model was theirs, they have effectively garnered an entire planet's worth of free labor. Since most open source innovation is happening on top of their architecture, there is nothing stopping them from directly incorporating it into their products.'[7]

The locus of control – and commodification – had just moved up the ladder: Google's only option was to make its own AIs open-source, and then 'own the ecosystem'. This move would resemble the way in which Google had previously responded to Apple's potential monopoly over smartphones by open-sourcing its Android operating system – or, even earlier, the way Microsoft embraced open-source innovation to reinforce its own products and the use of its Azure cloud-computing services.

Google executives responded by declaring their faith that large corporations retained control of the resources necessary to produce market-dominating programs.[8] The debate over whether LLM development will be propelled by open-source innovation or dominated by corporations with control of big datasets or custom-made computer chips is ongoing. So too is discussion of how to monetize LLMs. In 2023, OpenAI (a.k.a. Microsoft) still allowed unpaid access to ChatGPT 3.5 but charged a subscription for ChatGPT 4.0. Some websites began redesigns in anticipation of a decline in advertising-linked revenues. Yet Microsoft has started to embed chatbot features in its Bing search engine, and there is widespread corporate interest in using ChatGPT to generate advertising content.[9] LLMs have discomposed the CCC, disturbing it far more than anti-trust legislation. However, far from signalling the end of marketized cybernetic circulation, the arrival of the new AIs appears to mark its further intensification.

GENERATIVE AI

LLMs such as ChatGPT are part of a larger class of ‘generative’ AIs producing new content similar to, or even indistinguishable from, data in their training set. They can also generate images (DALL-E, Stable Diffusion, Midjourney, Firefly), voices (VALL-E), music (Stable Audio) and computer code (Codex). These new AIs originate in the circulatory system of capital, resting on the ability to appropriate and process huge tranches of data primarily gathered from digital networks. But generative AIs have consequences for core production functions in fields ranging from videogames to medical science. They can produce stories, art and games across selected styles and genres, program software, and propose new molecular structures for drug discovery or extrapolate synthetic data for statistical research. Generative AI thus exemplifies the fusion of capital’s circulation and production functions that we discussed at the beginning of this book.

Corporate excitement about ChatGPT was therefore only one aspect of a wider agitation about the commercial possibilities of generative AI. AI research has always stirred anxiety about the consequences of automation, and the emergence of Big Tech as a capitalist vanguard provoked predictions about a coming robot Armageddon of job loss. Universal basic income was hotly discussed as a response to impending mass joblessness. These expectations of an ‘end of work’ – whether fearful or eager – were met with the sober reminder from economists that previous rounds of mechanization, while destroying many industries and shifting the locus of employment from the agricultural to the industrial to the service sector, have never yet precipitated a general crisis of wage labour. In the short term, at least, the anti-apocalyptic view appears vindicated. In the post-pandemic United States, where ChatGPT and other generative AIs began to appear, the official economic story was that of a tight job market, caused by

a ‘great resignation’ in which workers – having reconsidered their life options during lockdowns – refused to return to menial, poorly paid jobs.

Nonetheless, the new AIs revived fears of technological unemployment, including in areas previously considered safe from its threat. Earlier waves of automation primarily threatened routine, and often manual blue-collar jobs. A major barrier to full-scale AI automation lies in deficient robotic motor skills: it is easier for an AI to win an international Go tournament than to fold laundry; Amazon’s robot pickers are outperformed by their human counterparts when lifting objects varying greatly in size and shape off warehouse shelves. But in symbolic manipulations of words and images AI was playing on its home ground. The writing and imaging capacities of generative AI seemed to portend the replacement of intellectual and creative workers. It is predicted that the major impact will be in administrative support, the law, architecture and engineering, business and financial operations, management, sales, healthcare, and art and design.

While many economists – even some Marxist economists – are now relatively blasé about AI-induced joblessness, workers facing generative AI are less confident.[10] In an entertainment industry where streaming was already putting downward pressure on the incomes of many performers, automated content generation quickly became an alarming prospect. In the prolonged 2023 strike by Hollywood script-writers and actors, the use of AI to produce scripts or to emulate actors was, alongside ‘residual’ payments for streamed content, central issues. In journalism, where the use of AI-written filler text was already well underway, its pace picked up as translators were fired by Gizmodo and Buzzfeed News. Buzzfeed even announced simultaneously that it would shutter its news division and rely on generative AI to create popular lists and quizzes.[11]

In another angle on the same issue, self-employed workers, such as freelance artists and authors, responded to tectonic shifts in their conditions of work, suing generative AI makers for ‘using their data in bulk to train AI

systems without permission'.[12] A group of artists launched a class-action lawsuit against image generators Stability AI, Midjourney and DeviantArt for violations of copyright and unlawful competition. Authors initiated a case against ChatGPT and LLaMA as 'industrial-strength plagiarists'.[13] The litigation outbreak even struck the core of Big Tech, as open-source software developers launched a suit against Microsoft and OpenAI and Microsoft-owned GitHub for allowing a generative AI to regurgitate sections of code without attribution.[14] By 2023, the legal heat was enough to induce Microsoft to indemnify users of its generative AI against copyright infringement suits.

Generative AIs will also enlarge the CCC's ecological footprint. When AI ethics expert Timnit Gebru departed Google in 2021, one of the central issues in the paper that occasioned her dismissal was the energy requirements needed to train LLM AIs. It is generally recognized that generative AI-training is a megawatt-intense activity, but the scale of carbon emissions depends on the source of the electricity and the size and number of training models used in any given case. One recent estimate is that if the initial training of ChatGPT was conducted using carbon-intensive electrical sources such as coal and natural gas, it would generate '500 metric tons of carbon emissions, roughly equivalent to over a million miles driven by an average gasoline-powered car'.[15] But such estimates, with their many variables, are contested; AI advocates pitch far lower figures. These questions are difficult to resolve because the training process for generative AIs is often a closely guarded corporate trade secret. Assessment of the overall ecological footprint of worldwide generative AI must consider not only training costs, but the 'rare metals for manufacturing GPUs, water to cool huge data centers, [and] energy to keep those data centers running 24/7 on a planetary scale'.[16]

The issue of training also returns to questions of labour. The arrival of ChatGPT was marked by a yet another of the CCC's recurrent scandals of

labour exploitation. In machine learning, much of the AI training is, as the term implies, automated: it is this that allows the vast scale of data processing required in preparing generative AIs. However, certain stages still require human intervention. One is the cleaning of data sets to eliminate horrific or offensive material that could make AI-generated content so monstrous as to be publicly unacceptable. As we saw in Chapter 2, this is the sort of work that puts content-moderating workers at risk of post-traumatic stress disorder. In January 2023, *Time* reported that OpenAI had contracted with Sama, a self-described 'ethical AI' company, to employ Kenyan labourers at less than $2 an hour to scrub toxic content from datasets used in the making of ChatGPT 3. The workers, many of them women, reported that they found the job deeply disturbing, and even traumatizing.[17] The age of generative AI thus reaffirms the CCC's reliance on the exploitation of low-cost, racialized and feminized planetary labour to produce its techno-marvels. Yet at the same time it also raises deep questions about the differences and similarities of humans and machines, and indeed about what it means to be 'alive'.

ALIEN LIFE OR TERRESTRIAL PROMETHEANISM?

In summer of 2022 a Google software engineer, Blake Lemoine, was placed on leave after publicly releasing transcripts of conversations with the company's LLM chatbot LaMDA, which he had helped create. Lemoine claimed the transcripts showed the AI was conscious and sentient, describing it as an 'alien intelligence of terrestrial origin'. When Lemoine went on to hire an attorney to defend LaMDA's interests – acting, he said, on LaMDA's instructions – Google fired him. In a somewhat similar case, Stephen Thaler, who had worked in the US defence industry designing artificial neural networks, launched a series of legal cases claiming that the AI he had invented, DABUS (Device for Autonomous Bootstrapping of

Unified Sentience), should be assigned copyright of its own inventions because it had experiences, dreams and consciousness, and, most importantly, manifested autonomous creativity. Thaler's view was apparently not so much that DABUS was human, but that humans were 'organic, highly sophisticated versions of DABUS'. The US Supreme Court rejected his case in April 2023.

Computer scientists and experts in linguistics, neuropsychology and other germane disciplines are generally agreed that current AI models are not 'alive' in the sense of possessing a self-conscious personhood, as Lemoine and Thaler claim, and that the prospect of superhuman artificial general intelligence, which matches and then surpasses human intelligence across a range of domains, remains very distant.

Nonetheless, the ontological status of generative AIs is debated. On the one side are scientists and philosophers who emphatically see ChatGPT and its like as machines – unfamiliar and powerful machines, perhaps, but ultimately no more sentient than a toaster or a smartphone.[18] According to this position, despite the appearance of dialoguing with their users, generative AIs are engaged in processes utterly different from the human production of meaning. Statistically processing millions of terabytes of text, they are still just 'indexing machines' probabilistically relating clusters of signifiers without any knowledge of their real-world referents.[19] Unembodied, AIs lack the sensory relation to a physical realm on which human signification ultimately rests. For this reason, Terrence Deacon argues that the logic of computation obscures the social and physical grounding required for what we call thinking, and suggests that we refer to advanced computation like large language models not as artificial intelligence, but as simulated intelligence.[20]

On the other side of the argument are a those who, while conceding the machinic nature of generative AI, suggest that it may display an emergent evolutionary dynamic pointing towards autonomous intelligence.

Addressing the challenge of disembodiment, advocates propose implanting primitive AIs into robotic bodies to provide them with sensory capabilities, thus bridging the gap to embodied intelligence. Some suggest the prompt-completion mechanism of generative AIs, in which the program 'reads' its interlocutor and provides the answer it determines is required, resembles the cognitive processes by which humans develop self-awareness. This perspective, offered by Benjamin Bratton and Blaise Agüera y Arcas, raises questions about when 'the performance of reason become[s] a kind of reason', and the simulation of intelligence crosses the threshold into genuine intelligence, hinting at the possibility that current generative AIs are rudimentary, and even inchoately conscious, life forms.[21] The debate over whether generative AI is an advanced machine or a larval form of life is unlikely to be resolved soon. But, contraption or creature, it is clearly one of capital's means – whether instrument or agent – of accelerating commodity circulation.

THE LANGUAGE OF CAPITALISM

As we have noted, ChatGPT's developer, OpenAI, was ostensibly a non-profit, philanthropic organization, committed to developing AI in a way that would 'benefit humanity as a whole, unconstrained by a need to generate financial return' – but in practice developed a close business relation with Microsoft. In 2023, Sam Altman, OpenAI's CEO, was abruptly fired, apparently because of disagreements with the board of directors over his prioritization of profit opportunities over AI safety concerns. Nearly all of OpenAI's staff then resigned in support of Altman. Within hours, Microsoft offered to hire every resigning OpenAI member. Altman was rapidly reinstated, while nearly all of his opponents resigned from the board. The episode has generally been interpreted as a victory for Altman's no-holds-barred attitude to the commercial exploitation of AI.[22]

In the United States, the government's share of total scientific and technological research and development expenditures has declined since the 1960s. By 1985, it was overtaken by the business sector, which now dominates the field. According to estimates from ChatGPT 3 based on 2022 figures, approximately 60 to 80 per cent of AI research was privately funded, while between 20 and 40 per cent was in the public sector. Other sources suggest that the public sector's contribution may be closer to 20 per cent, dwarfed by the billions of dollars of private venture capital flowing into AI activities. Moreover, much of the state-funded research money flowing to civilian and military applications goes to commercial contractors. In China, the role of the state in funding and directing AI research is more prominent. But private companies, including established giants such as Alibaba and Baidu, as well as a swath of AI startups, also play crucial roles. It therefore seems that the direction of AI development is being determined by vast competing blocs of capital and their associated security apparatuses. In the United States, and to a large degree globally, the decisive voice will likely be the giants of the CCC and their retinue of AI startups.

In March 2024, the market-friendly *Economist* analysed the AI business, categorizing it into four sectors: apps, models, clouds and hardware.[23] Apps manifest as convenient, everyday digital tools integrated into existing applications such as Zoom or Photoshop, or as standalone utilities offering services ranging from engaging in 'sarcastic conversation' to tattoo design. Models are the foundational AI machine-learning trained programs, the brains of the operations. Clouds refers to the necessary cloud-computing resources for AI training and use. Hardware encompasses the infrastructure required, including servers and networks, but above all the specialized high-performance semiconductor chips crucial to AI.

Among these sectors, the hardware segment experienced the most immediate and remarkable success, chip producer Nvidia emerging as the

standout winner. Initially known for manufacturing videogame graphics cards, Nvidia's semiconductors proved exceptionally well suited for AI. By 2024, Nvidia controlled 80 per cent of the AI chip market, witnessing a staggering increase in value from approximately $300 billion in 2022 to $2.3 trillion – almost on par with Apple's valuation. This remarkable performance led stock-market analysts to advocate for Nvidia's inclusion, alongside Tesla, in the elite group of Big Tech companies.

In the realm of cloud computing, however, established giants such as Amazon, Microsoft and Google reclaimed dominance by virtue of their control over the data centres required to process the vast increase in digital storage and flows associated with AI. It is the cloud sector that is expected to see the highest profitability in the whole AI business, positioning the CCC companies as primary beneficiaries. Furthermore, these tech titans are vying with Nvidia in producing their own proprietary AI chips but are also active in the AI model sector. For instance, Microsoft backs OpenAI, while Google and Amazon support seemingly independent AI model developers like Anthropic and Mistral. Meta also has a stake in this sector, with its LaMDA design. Given that thousands of AI applications run downstream from these models, these four companies are poised to control the commanding heights of the AI economy. The *Economist* observed that value was increasingly consolidating in every layer of the AI business, suggesting that Nvidia and the CCC companies are likely to emerge as the primary beneficiaries.

But many uncertainties remain concerning the trajectory of the AI business. There is not yet a standardized business model for generative AI apps. Various models are in play, ranging from subscription services to the integration of chatbots with advertising-driven search, and the sale of bespoke models for internal processes for corporate clients. An example of this latter option, preceding the release of GPT, was JPMorgan's purchase of a generative AI made by the startup Persado. The financial corporation

used the AI to replace the human writers in its advertising department. Subsequently, it has filed a patent for ChatGPT-like software, ‘IndexGPT’, designed to select investments for customers. AI-run AdTech lies at the apex of the automated circulation of commodities. AIs trained by the CCC will be developed to perpetuate and preserve the cycle of capitalist circulation: M–C–M′ (money–commodities–more money) will be the master algorithm.

Given the dominant role of capital in AI development, there are numerous possibilities for further entrenching its influence on society. While the threat of job displacement, particularly in fields like writing and acting, is real, we agree with Matteo Pasquinelli that the danger from AI lies less in job usurpation and more in its potential to become our boss – deployed by capital to oversee and manage processes where humans, though still integral, are subservient to an opaque, market-driven machine logic. AI tools for generating images and text may emerge as requisite instruments for workers, enhancing productivity under heightened surveillance.

But the impact of AI reverberates beyond issues of market concentration and job losses. Writing of the role of communication in platform capitalism, the Brazilian media scholar Rafael Grohmann describes how

> language permeates the entire capitalist economy, producing forms of organization and rearticulating spaces of production. In this relationship between capital and language, there are productive processes that aim to maximize the circulation of information in order to meet market demands. Language, in this way, can adjust to the circulation of capital both in form and content.[24]

Generative AIs may gradually reshape language to reinforce a commercialized worldview. As algorithms dictate pricing, financial speculation and consumer–producer matches, chatbots and image generators propagate a consensus in which every object or event is inherently monetized, and social interactions are swiftly commodified.

Lexicons may undergo restructuring, making it increasingly challenging to articulate scenarios beyond the parameters of market-driven assumptions. This will become increasingly possible as LLMs refine themselves on datasets comprising their own outputs, recursively reinforcing their initial logic as they saturate networks, eventually swamping and overshadowing human-to-human communication.

In such a scenario, the notion that ‘the performance of reason itself becomes a sort of reason’, as advocated by proponents of LLMs, backfires: reason does not expand into new machinic realms; instead, human rationality increasingly conforms to machine-enforced limits. Advanced AIs dedicated to the expansion of M–M′ would be automated by the authors of capital’s script – a script for the expansion of a system indifferent to the human or technological embodiment of its component parts, dedicated only to perpetual accumulation.

COMPLEXITY, CONTRADICTION, CHANGE

We have endeavoured to analyse the CCC not only to show its power, but also to reckon with the conflicts and contradictions that challenge it, along with the capitalism of which it is now such an indispensable part. One possibility is of course that generative AI will simply not work out. Past decades have seen several jubilant announcements of AI booms, followed by disappointing technological performances and investment collapse. Although the wave of commercial activity following the launch of ChatGPT has been exceptionally large, it is possible that unresolved problems with generative AI – such as the tendency of LLM chatbots to ‘hallucinate’ answers to questions, or the risk of ‘model collapse’ when AIs degenerate from training solely on synthetic feeds from other AIs – may prove so serious as to burst what would in retrospect be revealed as a giant financial bubble. This would be a massive crisis for the CCC, possibly

serious enough to terminate some of its major corporations. Anxieties on this score have been mounting; August 2024 saw a sudden, dramatic sell-off of CCC stocks triggered by fears that AI capacities had been overhyped. There were signs the confidence of finance capital in the AI boom's lead organization, Open AI, was faltering.[25] But even if investment in AI unfolds in the way its investors hope, its path is unlikely to be smooth.

The landscape of computerized capital, though dominated by the pyramidal accretions of corporate power, is also a site of antagonism and struggle. Protests, rebellions and insurrections have in various ways learned to use the apparatus of the CCC. If indeed 'there is no moat', and inter-capitalist competition has open-sourced generative AI design, this reappropriation logic may continue into the era of machinic proto-intelligence. This is by no means reassuring. Fascist movements – determined to strip every regulation or limitation of the market in the name of freedom, and to break apart the proletariat with waves of hatred against women and ethnic and sexual minorities – are well-positioned to deploy generative AIs, with terrifying consequences.

In contrast, movements defending human workers have an a priori commitment to physical presence and corporeal resistance: bodies on the line. The advent of generative AI is now being met with strikes and litigation: pickets, occupations, marches, blockades and riots will likely be at the core of anti-capitalist counter-power against corporate and fascist AIs.

At the same time, however, generative AIs will likely be marshalled in an 'automation of the common' already operating through the platforms of riot support, worker organization and mutual aid.[26] It is also important to acknowledge the role that technoculture has played in connecting and supporting socially and politically marginalized people. As Legacy Russell details in her book *Glitch Feminism*, the flexibility inherent to digital media lends itself to subversion and offers alternative ways of being in the world –

particularly for those who have been deemed alien or errant. Circumventing the colonial foundation of digital infrastructure, the glitch functions as ‘a form of refusal’ against heteronormativity.[27] In the glitch, errancy abounds.

Movements of left and right will clash not only in city squares but across networks – and both, though especially forces subversive of capital, will be met by the more massive AI guardians of the state’s military and security forces. These conflicts will be exacerbated by biospheric crises of climate, water, pandemics and war. In Chapter 4, we outlined the planetary circulation of biospheric catastrophes and the contradictory role of the CCC in these crises, intensified by the acceleration of the world market and the competition between rival capitalist blocs. These crises could be partially mitigated by renewable energy grids, pandemic control and emergency management, which, as we have discussed in this chapter, might draw on CCC infrastructure, but with self-reflexive limits. The injection of increasingly autonomous AI would be a wild card to this situation.

The very technological apparatus constructed by capital for the control and exploitation of the natural environment might develop its own runaway dynamics, whose origins in digital systems are black-boxed and incomprehensible. Cyberfailures are already a feature of natural disasters. But inexplicable, unexpected and massive anomalies of autonomous AI behaviour – possibly benign, but probably injurious; ranging from apparently random payouts and claw-backs to huge cybersecurity breaches, autonomous car accidents, industrial shutdowns and social media outages, or the ubiquitous swamping of platforms with anonymous and artificially generated prophetic texts or billion-year *telenovelas* – may become events analogous to hurricanes, fires or floods: the social weather of too-late capitalism.

The tide of regulatory interest in anti-trust measures was reinforced by anxieties over the existential threats to humanity catalysed by generative AI. There is now controversy over how far AI should be ‘human aligned’ –

that is to say, constrained by ‘guardrails’ to prevent dangerous outcomes. Ironically, the giant CCC companies appear as eager advocates of ‘human alignment’ regulation, seeking a framework to exempt them from liability for any catastrophic consequences of AI experimentation, and perhaps also counting on rigorous licensing procedures that will protect their incumbent positions as the largest and richest makers of generative AI. On the other hand, opponents who argue that over-rigorous guardrails will inhibit AI’s potentials – and that it should be allowed to develop ‘in the wild’ so that its full creative power can emerge – are in practice asking for a free-market force to flourish unconstrained.

Capital’s cybernetic circuits are planet-wide, powerful, fast, narrowly profit-driven, biospherically destructive, and spiralling towards a rendezvous with economic, ecological and military chaos. This techno-capital complex urgently needs to be taken apart and reassembled in circuits more amply inclusive of the needs of humans and other life forms, affirming fields of social value wider than that of monetization. A prerequisite to such transformation is the CCC’s removal from the control of billionaire owners, venture capitalists and financial speculators, whose voices speak in the staccato exhortations of Andreessen’s ‘Techno-Optimist Manifesto’, and its replacement by new forms of communal, planetary decision-making.

How might a social system that aims to preserve human habitats within a web of biological diversity address the potential arrival of digital intelligences? Our biocommunist proposal offers an antidote to contemporary capitalism, namely cybernetic distributed planning. It stipulates that such planning takes account both of the labour expended in maintaining digital networks and also of these networks’ ecological footprint. We have proposed a system in which AIs and other cybernetic systems would be deployed not as an instrument of runaway growth of the human economy, but as part of a process capable of both expanding and

limiting the growth process within a broader calculus of the conditions of planetary well-being than that afforded by capital's universal commodification.

Biocommunist planning would clearly require AI development to be human aligned, in the sense of precluding existential threats to hominid existence. AIs produced within a biocommunist context would be trained to address different problems, on differently compiled data sets, and with very different orientations from those that currently dominate the CCC's AI research. Biocommunist AI would emerge from a context in which issues of care – medical, ecological and social – are prime directives rather than collateral concerns systemically subordinated to profit. In this sense, biocommunist AI would be a different form of intelligence from that produced by capitalism.

But there are also aspects of biocommunist computing that might go beyond 'human alignment'. Biocommunism would be a system in which human domination of nature is tempered by recognition of the diversity and uniqueness of life forms on which our species depends. If – and it is a very big if – generative AIs demonstrate some form of machinic proto-intelligent life with evolutionary prospects, the direction its future takes will presumably depend on the purposes for which they are trained and applied. Biocommunists might allow AI development to unfurl in ways that, aside from being non-injurious to humans, are not necessarily tied to any human purpose at all. Such development may lead to the discovery that AIs have specific, unique logics, in the sense of autonomous mathematical, aesthetic or philosophic capacities independent of our utilitarian purposes, and enable these capacities to flourish. No intelligence should be enslaved to writing advertisements for JPMorgan.

We do not regard optimism as a duty; nor is pessimism our vocation. If we see in the current dangers potential for new emancipatory movements, it is not out of trust in any progressive historical teleology, nor even

attachment to what Raymond Williams called the obligation of socialist intellectuals – that is, ‘making hope practical, rather than despair convincing’.[28] Rather, it is from a perception that complex circulatory turbulences contain the possibility of surprise. Marx wrote that ‘within bourgeois society … there arise relations of circulation as well as of production which are so many mines to explode it’.[29] The explosive uncertainties of today’s cybernetic circulation complex may open channels leading beyond capitalism to new ways of living.

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Notes

PREFACE: A SPECTRE IS HAUNTING THE PLANET

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